CONTROLLERS

Select the ideal controller from various command input formats. Servo parameters and acceleration patterns optimized for each robot are pre-stored, so you can start operating the robot right away without making troublesome setups.

YAMAHA's line up

Robot positioner

I/O point trace | Remote command

P.396

TS-S TS-P TS-X

Robot driver

Pulse train input

P.408

TS-SD RDP RDX

Robot controllers

Program | I/O point trace | Remote command | Online instructions

P.417

1 axis

ERCD SR1-X SR1-P

2 axes

RCX221 RCX222

3 / 4 axes

RCX240/RCX240S

5 to 8 axes

YC-LINK couples single-axis controllers to a 4-axis controller

Point 1

Optimal setup

Setting the parameters is simple

Robot controllers are designed in-house for YAMAHA robots. Optimal values for servo parameters required for operating the robot such as gain are stored beforehand in the robot.

Setting acceleration/deceleration is easy

The acceleration/deceleration is a critical factor in determining the machine service life. Setting the acceleration too high will shorten the machine service life, while setting it too low will prevent effective use of motor power and lower the tact time. The acceleration/deceleration on YAMAHA robot controllers is determined to a fine degree for each model by the payload. By simply entering payload parameters, acceleration and deceleration rates will be automatically optimised to provide suffiecent robot service life and motor performance. Detailed robot knowledge from YAMAHA is what makes this possible. Moreover, SCARA robots are also equipped with zone control function that constantly delivers maximum performance that takes into account fluctuations in inertia due to the state of the arm (folded/extended).
(Note. On pulse train input types the acceleration/deceleration must be set by the customer.)

Point 2

Multi-functions and expandability

- Multi-axis controllers support up to 10,000 points, and single-axis controllers up to 1,000 points (255 points on the TS series). Up to 100 programs can be made on either type controller.
- Supports various field networks including CC-Link, DeviceNet, Profibus, Ethernet, EtherNet/IP [Note].

  Note. Some models do not support all networks.
- The TS series, RD series, SR1 series, and RCX series utilize a dual power supply system where the control power supply and (main) power supply are separate.
- Controllers support CE markings for EU (European) safety standards and so can also be used with confidence overseas. The TS series (except for TS-S), SR1 series, and RCX series can support safety category 4.

To view detailed information on each controller's functions see the controller specification pages from P.391.

Point 3

Diverse command methods

YAMAHA controllers allow the user to select from an ample array of control methods including programming, point trace and pulse train to match the customer's application.

Program entry

YAMAHA SRC language

<examples>

MOVA 1 , 100	Move to point No. 1 at 100% of speed.
DO 1 , 1	Turn general-purpose output No. 1 to ON.
WAIT 2 , 1	Wait until general purpose input No. 2 turns ON.

YAMAHA BASIC language

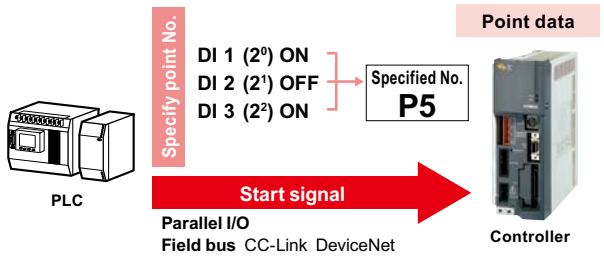
<examples>

IF DO(10)=1 THEN *END	Jump to *END if general-purpose input No. 10 is ON. If not ON, then proceed to next line.
MOVE P, P2, STOPON DI(1) =1	Move to point No. 2. Stop if general-purpose input No. 1 is ON during movement.
WAIT ARM	Wait until robot arm operation ends.
P3=WHERE	Write the current position in point No. 3.
***END:**	Define the label with the "END" name.
HOLD	Pause the program.

Single-axis robot controllers use the YAMAHA SRC language Note which is simple yet contains all required functions such as I/O outputs and conditional branching, etc. The multi-axis controller RCX series uses the YAMAHA BASIC language capable of more sophisticated programs and includes all types of arithmetic computations, flexible setting of variables and various conditional branching, etc. Both are easy to use robot language conforming to BASIC. These match all manner of needs from simple beginning operations to sophisticated expert user tasks.

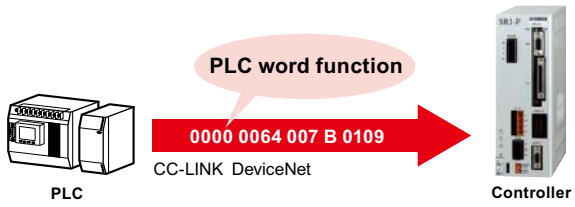
Note. The 2-axis controller DRCX also uses YAMAHA SRC language.

I/O point trace



The host device specified a point No. in binary and the robot moves to that point No. when a start signal is input. The controller can operate just by teaching the point data and does not need a program.

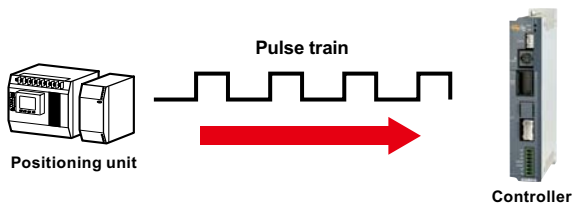
Remote command



This uses CC-Link or DeviceNet word functions to issue various data or commands to the robot. It makes full use of word function expandability ranging from simple operation instructions to writing of point data and other sophisticated instructions and allows fully and flexibly using robot controller functions from a host device.

Note. These functions are operable when selecting the option network board.

Pulse train



A pulse train sent from the positioning unit controls the robot. The controller does not have to handle programs or point data.
This control method is convenient when one wants to concentrate control in a host or upstream device.

Online instructions

A PC connected via RS232C or Ethernet Note can be used to issue various commands and data directly to the robot controller or receive data and status. All operations performed from a teaching pendant can be executed from a PC.

Note. Ethernet is operable by selecting the option network board.

Control method classification table

		TRANSERVO Stepping motor	FLIP-X [T4L/T5L/YMS] Small servo (24V / 30W)	FLIP-X General-purpose servo (30 to 600W)	PHASER Linear motor	
1 axis	● I/O point trace ● Remote command	P TS-S		P TS-X	P TS-P	TS-S/ TS-X/TS-P P.396
	● Pulse train	D TS-SD	C ERCD	D RDX	D RDP	TS-SD P.408 RDX/RDP P.412 ERCD P.417
	● Program (YAMAHA SRC language) ● I/O point trace ● Remote command ● Online instructions			C SR1-X	C SR1-P	SR1-X/SR1-P P.421
2 axes	● Program (YAMAHA BASIC language) ● I/O point trace ● Remote command ● Online instructions			C RCX222	C RCX221	RCX221/ RCX222 P.431
3, 4 axes	● Program (YAMAHA BASIC language) ● I/O point trace ● Remote command ● Online instructions			C RCX240 RCX240S		RCX240/ RCX240S P.438
5 to 8 axes	**YC-LINK couples single-axis controllers to a 4-axis controller**					

P : Robot positioner D : Robot driver C : Robot controllers

TS-X/TS-P P.396 FLIP-X PHASER

[Robot positioner]

TS-X

TS-P

Operation method : Point trace
Remote command
Points : 255 points
Input power : AC100V / AC200V
Position detection : TS-X Absolute
Incremental
TS-P Incremental
Semi-absolute

Simple operation only by specifying point number data

The TS series are robot positioners that operate just by specifying a point No. and entering a START signal. These can do positioning or push operations without having to write a program. Speed changes can be made during movement by carrying out linked operation.

Low price

Costs were drastically cut compared to prior robot controllers by limiting the point trace functions and meticulously reviewing the circuit design. These helped achieve a price approximately 50% lower than the SR-1 series.

Completely applicable to absolute system

TS-X is completely applicable to the absolute system. No origin return operation is needed.Additionally, the backup battery is stored into the main unit. This tidies the inside of the electric component box. The backup battery can be replaced only by opening the front cover of the main unit. (Backup period is 1 year.)

Two pushing operation patterns

Two pushing operation patterns are incorporated. In addition to a normal mode, in which the pushing operation is performed at a low speed with a set pressing load, a “pushing after deceleration” mode is incorporated, in which the pushing operation is started after the robot has moved to a portion close to the target position and decelerated properly.

TS-S P.396 TRANSERVO

TS-S

Operation method : Point trace
Points : 255 points
Input power : DC24V
Position detection : Incremental

Maximum acceleration auto setting

The acceleration is a critical parameter that determines how long the robot can continue operating (or service life). The maximum acceleration is automatically set by taking the service life by model or transfer weight into consideration. In the custom setting of the TS series, acceleration or speed can be input in the SI unit system. At this time, the upper limit value is automatically set. This eliminates any worry about setting the acceleration too high by mistake.

Free speed change even during movement

Incorporating of a merge operation function makes it possible to easily change the speed parameters (acceleration and/or deceleration) even during movement.Additionally, when multiple points are merged and the same speed is set for each point, the signal can be output to the host controller every time the robot passes through each point.

Powerful support software: TS-Manager

The low-cost and high-performance TS-Manager was newly developed for the TS series. This single software performs all operations such as point data settings, editing, backup and teaching tasks. It also comes loaded with real-time trace functions such as current values, speed, load factors, current values, and voltage values.

LCD monitor showing easy-to-understand operation status display

On the TS-X/P, an LCD monitor integrated into the unit is available as option. It allows finding values such as the operation status, current position, speed and load factor at a glance.

TS-SD P.408 TRANSERVO

[Robot driver]

TS-SD

Operation method : Pulse train
Input power : Control power supply : 24 V DC±10%
Main power supply : 24 V DC±10%
Position detection : Incremental

Pulse train input driver for single-axis robot “TRANSERVO”

Robot driver that supports pulse train input has now been added for YAMAHA single-axis robot “TRANSERVO”.

Uses the same control as the TS-S

Design based on the TS-S robot positioner allows easy control combining the best points of servos and stepping motors.
A highly reliable resolver used for the position sensor delivers a resolution of 20480 pulses per revolution.

Supports a wide range of pulse train control

Supports open collector and line driver methods selectable by parameter setting and signal wiring connection.
The open collector method is compatible with a wide voltage range from 5 to 24 V, and easily matches specs of the host device you want to use.

Operable with the TS-Manager software for the TS series

The TS-SD can be operated with the TS-Manager software (Ver. 1.3.0 or later) having a full range of functions including robot parameter setting, backup, and real-time trace the same as on the TS series controllers.
(The handy terminal “HT1” cannot be used with the TS-SD.)

RDX/RDP P.412 FLIP-X PHASER

[Robot driver]

RDX

RDP

Operation method : Pulse train
Input power : Main power 3-phase AC200V
Control power Single phase AC200V
Position detection : RDX Absolute
Incremental
RDP Incremental

Special pulse string control driver

These are dedicated pulse train input robot drivers for the YAMAHA single-axis robot FLIP-X series and the PHASER series. Using dedicated pulse train control allows eliminating operation via robot language so this can be easily assembled into automated units as a control device for compact and low-priced robot mechanisms.

Low price

By rationalizing functions and using the structure with reduction of parts and ease of assembly taken into consideration, the cost is reduced by 35% as compared with YAMAHA's conventional product.

Compact

Compact design of H160 × W57 × D130mm. The size reduction to 65% of the YAMAHA's conventional product in volume has as been achieved. It saves space in the control panel.

Easy tuning

YAMAHA offers optimal parameters for each particular robot model. This completely eliminates having to make bothersome servo positioning such as needed when building up systems that use general-purpose servo drivers. Due to the unique features of pulse train input, the acceleration/deceleration settings are entrusted to the customer however YAMAHA supplies material with each machine model for use as a general guide when making acceleration settings.

Origin return function

As a special origin return input function is provided, returning to the origin is executed automatically without making a complicated sequence. (Customer can also enter a sequence.)

Analog output function

Analog monitor output terminals for 2 channels are provided.
This function can be used to select parameters for speed detection values, torque command values, speed command values, speed deviation, position deviation, electrical current values, command pulse frequency, and the regenerative braking usage rate.

Easy operation environment

Use of the special PC software "TOP" enables pleasant and easy operation by means of GUI.

ERCD P.417 T4L/T5L YMS

[Single-axis robot controllers]

ERCD

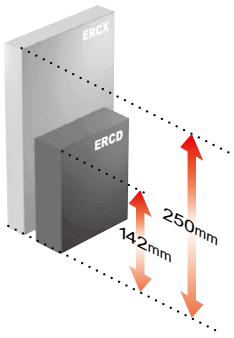
Operation method : Program
Point trace
Remote command
Online command
Pulse train
Points : 1000 points
Input power : DC24V
Position detection : Incremental

5 command formats

Select from 5 command formats including program operation that allows using diverse commands, or point trace operation that works just by specifying a point No., or remote commands, on-line commands, and pulse train input.

Compact design

Along with sophisticated functions, the ERCD also has a compact box shape of W44 × H142 × D117. It is compact, only taking up about 62% of the area used by the prior YAMAHA ERCX model. This allows greater freedom for use of installation space.

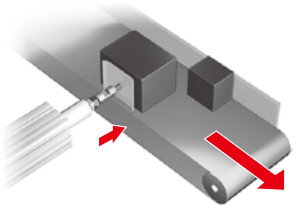


Diverse input/output functions

The ERCD includes a feedback pulse output function that allows easily controlling the current position from a host control device. Moreover, movement point numbers can be easily output in binary during point trace so operation points are easy to check. Teaching functions can also be added by way of I/O, and there is more freedom in building up the system and it is easier to use. This output is also effective for program and point trace operation, and the number of outputs can be changed as needed by a divider setting.

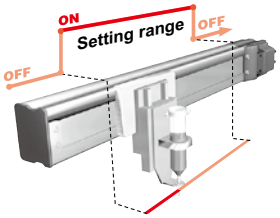
Torque restriction control

As the torque restriction can be controlled using the program command, the axis can be stopped with the torque applied. This function is usable for continuous positioning of works of different sizes, press-fitting work and work retaining operation.



Zone output function

It is possible to set ON / OFF of the general purpose output between any points by using the parameter setting. Also, the axis position can be judged easily by using an external equipment as positive logic / negative logic settings can be made. Settings are acceptable up to 4 patterns.



SR1-X/SR1-P P.421 FLIP-X PHASER

[Single-axis robot controllers]

SR1-X

SR1-P

Operation method : Program
Point trace
Remote command
Online command
Points : 1000 points
Input power : AC100V / AC200V
Position detection :
SR1-X Absolute
Incremental
SR1-P Incremental
Semi-absolute

Diverse command methods

Select an optimal method from the different command methods including program operation, point trace, remote command, and on-line command. Program uses the YAMAHA SRC language resembling BASIC. Use it to execute a variety of operations ranging from simple tasks to I/O output and conditional branching, etc.

I/O assignment function

Besides the usual program operation, changing the I/O assignment allows selecting operations such as point trace, point teaching, and trace operation by specifying coordinates. In point teaching mode Jog can be performed via the I/O so a host device can perform point teaching even without an HPB.

Supports complete absolute specifications

The SR1-X supports complete absolute specifications. No origin point return is needed (backup period with no power supplied is 1 year).

Current position output function

These controllers can output the position data as feedback pulses or binary data. This allows the host device to find the current robot position in real-time. These are also loaded with functions such as point zone output that outputs the zone or a point No. in its vicinity.

Torque limiter

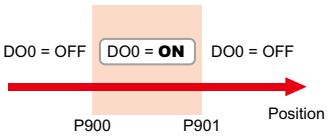
This function limits the maximum torque command value to an optional timing and so is effective in operations such as grip and press-fit. Besides using parameter data values for torque limiting, analog input voltages can also be used to limit the torque.

SR1-X / SR1-P / ERCD Diverse functions

Position data output function

Zone output

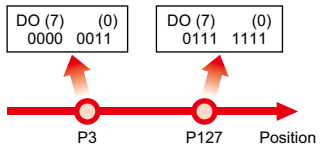
Outputs whether the robot position is within the specified range or not.



It is possible to reverse the output logic.

Point zone output

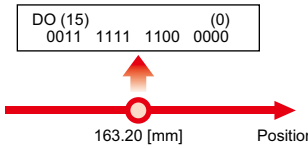
Outputs the number of the point near the robot position in the binary output.



It is also possible to limit to the moving point only.

Binary output

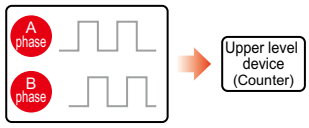
Outputs current robot position by 16bits binary. (This function is only available on the SR1)



It is possible to adjust the unit of the output position data by using parameters.

Feedback pulse output

Outputs the current position counter value of the robot through the A/B phase line driver.

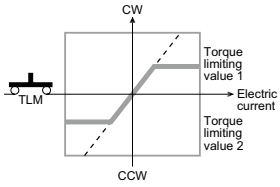


It is possible to monitor at real time by using the upper level device. A division function is installed.

Torque limiting drive

It is possible to perform such actions as pressing and gripping the work by restricting the torque during operation.

General idea



Features

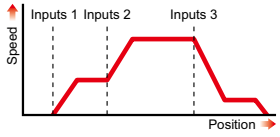
SR1
- Control over limit timing at the upper level by TLM input.
- Grasp of limit condition by torque limit condition output (TLON).
- Selection of torque limit value by input (up to 4 patterns).
- Allows torque limiting with the program command.
- Limit of the torque by analog input (0 to +10V/12bit).

ERCD
- Limits the torque by using the T program command.

Changing movement data function

Possible to change the moving speed and programmed position while moving. (This function is SR1 only.)

General idea



Features
- Control over movement change timing at the upper level by movement command input.
- The movement command is either ABS-PT (absolute movement command) or ABS-BN (Binary specification movement command).
- Selection of speed specification is 1 to 100% (up to 4 patterns).
- Change in the deceleration range is invalid.

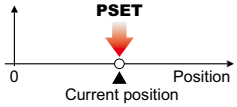
Point instruction

It is possible to execute jog movement of the robot and point teaching from the upper level device.

General idea

- Robot is moved to the position where teaching is to be done by the JOG+/JOG-command.

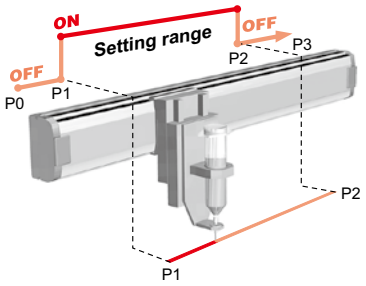
- The current position is registered to the number of the point specified by PSET input.



Handy YAMAHA SRC language functions

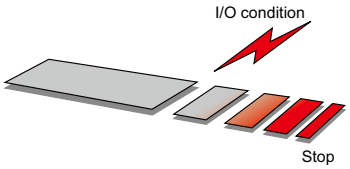
Multitask function

This function enables to execute up to 4 tasks of peripheral equipment of the robot at the same time. With the multitask function combined with the JMPP command, it is possible to have I/O output when the specified point is passed during movement.



Function to make conditional stop during movement

The arm can be decelerated and stopped, using I/O conditions of the MOVF command while it is moving. This function is useful when searching the target position with a sensor.



RCX series (RCX221 / 222) P.431 (RCX240/240S) P.438 Supports all models

[Multi-axis controller]

RCX221

Operation method	: Program Operation via communication commands
Points	: 10000 points
Input power	: AC200V
Position detection	: Incremental Semi-absolute

RCX222

Operation method	: Program Operation via communication commands
Points	: 10000 points
Input power	: AC200V
Position detection	: Absolute Incremental

RCX240

Operation method	: Program Operation via communication commands
Points	: 10000 points
Input power	: AC200V
Position detection	: Absolute Incremental

Supports all YAMAHA robot models

The RCX series supports all YAMAHA robot models such as the PHASER, FLIP-X and XY-X. It makes most types of applications possible since single-axis (FLIP-X/PHASER) and Cartesian robot can be used in any desired combination (not including some small single-axis robots).

Complete absolute specs

The RCX uses complete absolute specifications so of course no origin return is needed when the power is turned on. It also supports incremental specifications on a completely identical system (The PHASER series utilizes a magnetic scale and supports semi-absolute or incremental specifications.)

Longer extended absolute data backup time

Making an energy-saving backup circuit has drastically extended the retention time for absolute position data with no power applied. Ordinary model backup time was a maximum of 1 month has now been boosted to 1 year. Current position information can now be monitored during long vacations, equipment storage, or even during transport, and origin return is not needed when power is restored. This allows quick and easy production startups.

Area check output function

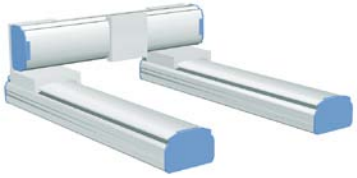
This function provides an output signal when the robot enters a preset area. Up to four areas can be specified.

Dual-synchronous drive

Equipped with the dual drive function to control 2 axis in synchronization, which is of effective use for carrying heavy items and long stroke operation with the Cartesian robot. This function enables good use of high speed, acceleration/deceleration features of the YAMAHA robots.

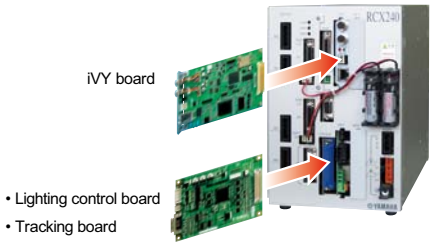
Note. For the dual drive function, custom order arrangement is required. For more information, contact YAMAHA.

■ Dual-synchronous drive example.



Supports the robot vision “iVY System”

The RCX series also supports the YAMAHA robot vision “iVY System” capable of handling a vast range of applications yet is simple to setup. Installing the vision board inside the controller unit drastically simplifies the calibration task that up to now took a lot of time and trouble. Performing position offset at image recognition widens the device sphere of applications and makes it usable for general-purpose tasks (only supported on RCX240).

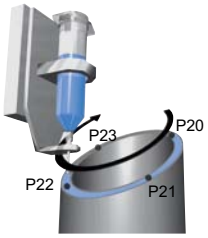


Double-carrier anti-collision control function

Collisions between carriers when using double-carriages can be prevented by a control function within the controller. Former collision prevention measures such as zone judgments or external sensors are no longer needed so double-carriers are now easier to use than ever before.

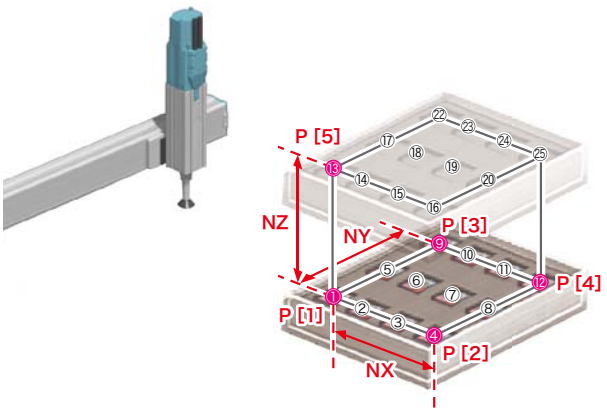
3D circular interpolation control

2D and 3D linear and circular interpolation ARC control are possible, making the RCX141 controller ideal for sealing work, etc. (3-dimensional interpolation is only available on the RCX240)



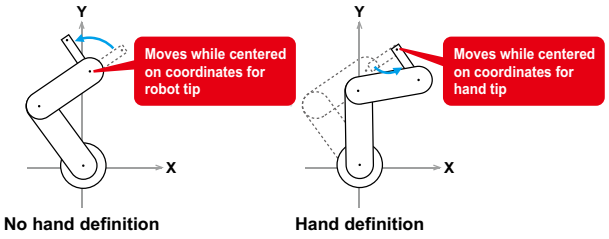
Palletizing function

This function can easily define a maximum of 20 types of pallets by just entering the teaching points for the 4 corner positions on the pallet. Entering teaching points along the height allows handling cubic pallets. Specify the defined pallet No. and execute the movement command to perform palletizing. The program can execute various actions such as 1 point → pallet, pallet → 1 point, pallet → pallet, etc.



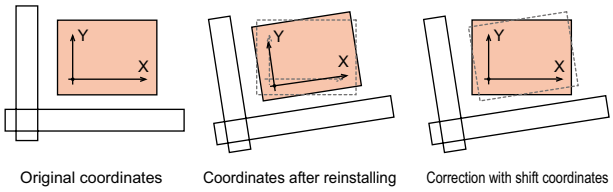
Hand definition

This function operates the robot based on coordinates when the tool tip has been installed in the tip of the robot shaft in an offset position. This is especially effective during tool rotation on SCARA robots and robots with rotating shafts.



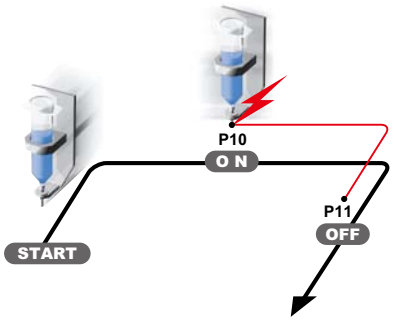
Shift coordinates

A deviation or offset might occur in the coordinates during service tasks such as robot reinstallation or replacement. In those cases using the coordinates can be corrected by using the shift coordinate function so point data can be utilized without having to make changes and there is no need for reteaching.



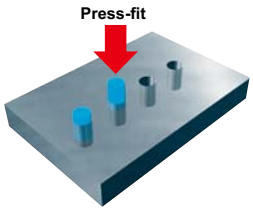
Passing point output control

This function can turn general outputs ON or OFF at specified points so operation can continue with no stops along an axis during interpolation tasks.
This outputs a spray ON or OFF signal while still operating on an axis during sealing to allow stable and smooth coating of sealant.



Torque limiting drive

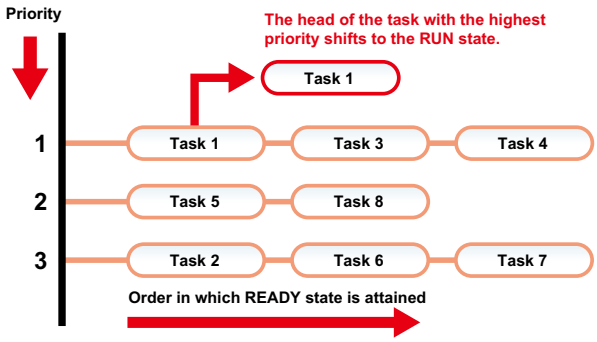
The motor torque can be limited during grasping and press-fitting operations.



Multitask function

This function executes multiple tasks (up to eight tasks) Multiple tasks will switch with the timesharing method. However, a priority can be assigned to each task. This priority can also be changed while tasks are running. The multitask function simplifies the entire system's control configuration and also improves the operation efficiency.

■ Task scheduling

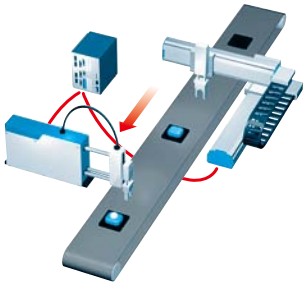


Sequence program

In addition to the standard tasks, a task to control input/output (parallel, serial, memory, timer) can be executed independently. As the sequence program is effective in the manual mode as well, it is usable to construct the safety system linked with the peripheral equipment.

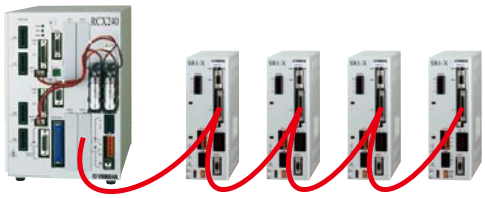
2-robot control

Assigning 2 robot units as main and sub allows them to be simultaneously operated by 1 controller unit. Combining this with multi-tasking allows 1 controller unit to link 2 robot units in a smooth, sophisticated operation.



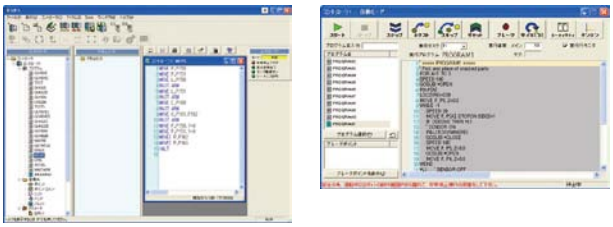
Additional axis function "YC-Link"

Using an optional YC-Link, the RCX series controller and SR1 series single axis controller can be linked easily. If necessary, by linking some controllers, it is possible to control up to 8 axes (Max. 6 axes for simultaneous control).



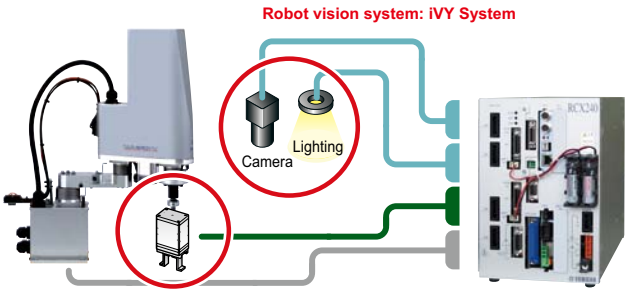
Full support software: VIP+

VIP+ is an easy to operate application software that makes it easy to visually understand tasks including robot operation, program writing and edit, and point teaching.
The user interface has been vastly improved compared to previous support software VIP and is now extremely easy to use.



Can be used with a "YRG series" electric gripper

All functions of a gripper can be controlled from one RCX240 controller. Setup and startup are very easy since no signal exchange with a PLC or host device is required.



RCX240

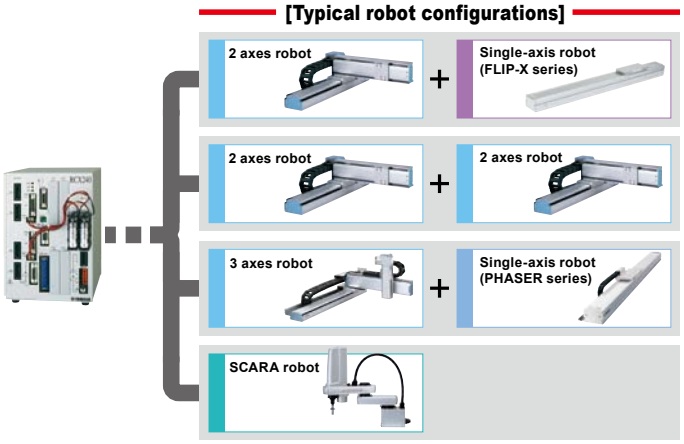
[Multi-axis controller]

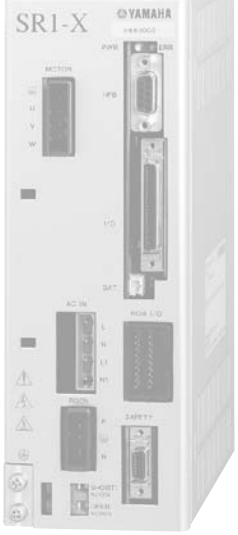
The YAMAHA controller RCX240 is usable on all models (except some small single-axis robots).

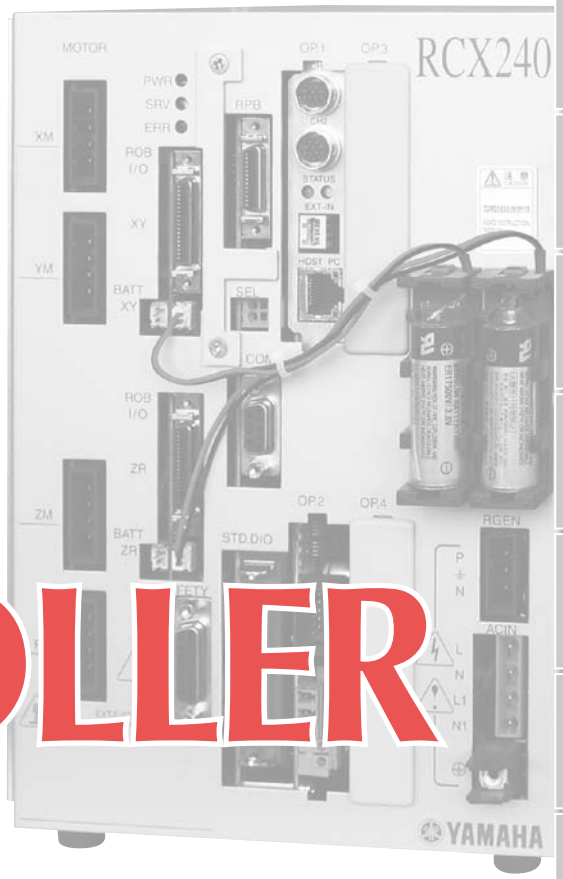
The RCX240 supports all YAMAHA robot models

The 4-axis robot controller RCX240 supports all robot models including single-axis, Cartesian, SCARA, and Pick & Place. It can also control a mix of models including the FLIP-X ball screw type and PHASER linear motor type which allows a high degree of freedom when assembling systems to match your application. This 1 unit is all you need to service multiple robot units. By just changing its settings you can operate any model.

[Typical robot configurations]







YAMAHA ROBOT CONTROLLERS

CONTROLLER

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CONTROLLER FEATURE DESCRIPTION

Single-axis

TS-S

Robot positioner

- **Dedicated compact single-axis TRANSERVO**

P.396

Operating method : I/O point tracing / Remote command / Operation using RS-232C communication
Points : 255 points
Input power :
Main power supply DC24V +/-10%
Control power supply DC24V +/-10%
Position detection method : Incremental
Field networks : CC-Link, DeviceNet

TS-X / TS-P

Robot positioner

- **Single-axis robot FLIP-X**
- **Linear motor single-axis PHASER**

P.396

Operating method : I/O point tracing / Remote command / Operation using RS-232C communication
Points : 255 points
Input power : AC100V / AC200V
Position detection method :
TS-X Absolute / Incremental
TS-P Incremental / Semi-absolute
Field networks : CC-Link, DeviceNet

TS-SD

Robot driver

- **Dedicated compact single-axis TRANSERVO**

P.408

Operating method : Pulse train control
Input power :
Main power supply DC24V +/-10%
Control power supply DC24V +/-10%
Position detection method : Incremental
Field networks : Not supported

SR1-X / SR1-P

Robot controller

- **Single-axis robot FLIP-X**
- **Linear motor single-axis PHASER**

P.421

Operating method : Programming / I/O point tracing / Remote command / Operation using RS-232C communication
Points : 1000 points
Input power : AC100V / AC200V
Position detection method : SR1-X Absolute / Incremental
SR1-P Incremental / Semi-absolute
Field networks : CC-Link, DeviceNet, Profibus

RDX / RDP

Robot driver

- **Single-axis robot FLIP-X**
- **Linear motor single-axis PHASER**

P.412

Operating method : Pulse train control
Input power :
Main power supply 3-phase AC200V
Control power supply single phase AC200V
Position detection method : Incremental
Field networks : Not supported

ERCD

Robot controller

- **Single-axis robot T4L / T5L**
- **Clean single-axis C4L / C5L**
- **Rod type YMS**

P.417

Operating method : Pulse train control / Programming / I/O point tracing / Operation using RS-232C communication
Points : 1000 points
Input power : DC24V
Position detection method : Incremental
Field networks : Not supported

1 to 2 axis

RCX221 / RCX221HP

Robot controller with advanced functions

- Single-axis robot FLIP-X
- Linear motor single-axis PHASER
- Cartesian robot XY-X
- Pick & place YP-X

P.431

Operating method	: Programming / Remote command / Operation using RS-232C communication
Points	: 10000 points
Input power	: AC200V
Position detection method	: Incremental / Semi-absolute
Field networks	: CC-Link, DeviceNet, Profibus, Ethernet

RCX222 / RCX222HP

Robot controller with advanced functions

- Single-axis robot FLIP-X
- Cartesian robot XY-X
- Pick & place YP-X

P.431

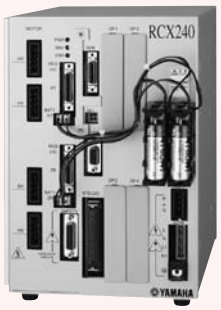
Operating method	: Programming / Remote command / Operation using RS-232C communication
Points	: 10000 points
Input power	: AC200V
Position detection method	: Absolute / Incremental
Field networks	: CC-Link, DeviceNet, Profibus, Ethernet

1 to 4 axis

RCX240 / RCX240S

Robot controller with advanced functions

- Single-axis robot FLIP-X
- Linear motor single-axis PHASER
- Cartesian robot XY-X
- SCARA robot YK-XG
- Pick & place YP-X



P.438

Operating method	: Programming / Remote command / Operation using RS-232C communication
Points	: 10000 points
Input power	: AC200V
Position detection method	: Absolute / Incremental / Semi-absolute
Field networks	: CC-Link, DeviceNet, Profibus, EtherNet/IP

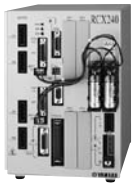
CONTROLLER SPECIFICATION SHEET

Category				Robot positioner			Robot driver			
Name				TS-S	TS-X	TS-P	TS-SD	RDX	RDP	
External view										
Operating method				I/O point tracing / Remote command / Operation using RS-232C communication			Pulse train control			
Input power				● **Main power supply** DC24V +/-10% maximum ● **Control power supply** DC24V +/-10% maximum	● **Main power supply / Control power supply** **AC100V specifications** Single phase 100 to 115V +/-10% maximum (50/60Hz) **AC200V specifications** Single phase 200 to 230V +/-10% maximum (50/60Hz)		● **Main power supply** DC24V +/-10% maximum ● **Control power supply** DC24V +/-10% maximum	● **Main power supply** 3-phase 200 to 230V +10% to -15% (50/60Hz +/-5%) ● **Control power supply** Single phase 200 to 230V +10% to -15% (50/60Hz +/-5%)		
Number of controllable axes				Single-axis			Single-axis			
Applicable robot	New concept compact stepping single-axis motor	TRANSERVO		●	–	–	●	–	–	
	Single-axis robot	FLIP-X	T4L / T5L / C4L / C5L / YMS	–	–	–	–	–	–	
			FLIP-X other than above	–	●	–	–	●	–	
	Linear motor Single-axis robot	PHASER		–	–	●	–	–	●	
	Cartesian robot	XY-X		–	–	–	–	–	–	
	SCARA robot	YK-X		–	–	–	–	–	–	
	Pick & place robot	YP-X		–	–	–	–	–	–	
Position detection method				Incremental	Absolute / Incremental	Incremental / Semi-absolute	Incremental			
Maximum number of programs				(program not required)			–	–		
Maximum number of steps per program				(program not required)			–	–		
Points				255 points			–	–		
Multitasks				–	–	–	–	–		
I/O points		Dedicated I/O		16 points / 16 points	16 points / 16 points	16 points / 16 points	–	–		
		General I/O		–	–	–	–	–		
CE marking				●	●	●	–	–	–	
Programming box				HT1 / HT1-D (with enable switch)			–	–		
Support software for PC				TS-Manager			TS-Manager	TOP		
Detailed info page				P.396			P.408	P.412		

Note 1. Maximum number of general-purpose I/O points when a total of two option boards OP.1 and OP.2 (one each) are installed.
Note 2. Maximum number of general-purpose I/O points when option OP.DIO boards (4 boards) are installed.

Controller operating methods

- Point trace : Host device specifies a binary point number and robot moves to the specified point when a start signal is input. Controller does not need a program and operates just by teaching point data.
- Remote command : Controller issues a wide range of commands and data to the robot via CC-Link or DeviceNet word functions. Host device can freely use robot controller functions as needed.
- Pulse train : Controller operates robot by pulse train from positioner unit. Controller needs no programs or point data. Pulse train operation is convenient to allow the host device to concentrate on robot control.
- Online instructions : PC can send various commands and data directly to the robot controller via RS232C or Ethernet and receive status information and data.

	Robot controller					
	ERCD	SR1-X	SR1-P	RCX221 RCX221HP	RCX222 RCX222HP	RCX240 RCX240S
						
	Pulse train control / Programming / I/O point tracing / Remote command / Operation using RS-232C communication	Programming / I/O point tracing / Remote command / Operation using RS-232C communication		Programming / Remote command / Operation using RS-232C communication		
	DC24V +/-10% maximum	● **Main power supply /** **Control power supply** **05 / 10 driver** Single phase 100 to 115V/200 to 230V +/-10% maximum (50/60Hz) **20 driver** Single phase 200 to 230V +/-10% maximum (50/60Hz)		● **Main power supply /** **Control power supply** Single phase 200 to 230V +/-10% maximum (50/60Hz)		
	Single-axis	Single-axis		2 axes maximum	2 axes maximum	4 axes maximum
	–	–	–	–	–	–
	●	–	–	–	–	–
	–	●	–	●	●	●
	–	–	●	●	–	●
	–	–	–	●	●	●
	–	–	–	–	–	●
	–	–	–	–	●	●
	Incremental	Absolute / Incremental	Incremental / Semi-absolute	Incremental / Semi-absolute	Absolute / Incremental	Absolute / Incremental / Semi-absolute
	100	100		100	100	100
	1024 steps	3000 steps		9999 steps	9999 steps	9999 steps
	1000 points	1000 points		10000 points	10000 points	10000 points
	4	4		8	8	8
	8 points / 3 points	8 points / 4 points		10 points / 12 points	10 points / 12 points	10 points / 11 points
	6 points / 6 points	16 points / 16 points		40 points / 24 points (Max.) Note 1	40 points / 24 points (Max.) Note 1	112 points / 72 points (Max.) Note 2
	●	●	●	●	●	●
	HPB / HPB-D (with enable switch)			RPB / RPB-E (with enable switch)		
	POPCOM			VIP+ / VIP		
	P.417	P.421		P.431		P.438

Single axis

TS-S/TS-X/TS-P

TS series

Robot positioner　CE compliance

TS series are positioner type controllers that only performs point trace. No program is needed. Operation is simple. After setting point data, specify the point number and enter a START signal from host controller such as a PLC. Positioning or pushing operation then begins.

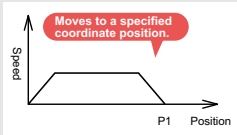
TS-S　TS-X　TS-P

Features

1 Main operation patterns

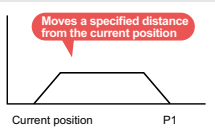
Normal operation

ABS (absolute) operation



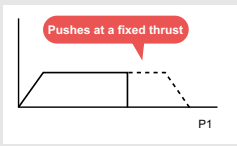
Moves to the target position relative to the origin point and completes positioning.

INC (incremental) operation



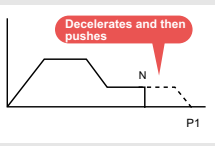
Moves from the current position just by a distance specified in point data and completes positioning.

Pushing operation



Moves while pushing at a preset push force.

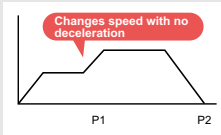
Pushing after decelerating



Pushing starts after decelerating at a distance equal to "Near width (N)" from the target position.

Merge operation

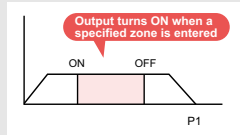
Merge operation



Moves to multiple points in succession. If different speeds were set, then the speeds are changed without decelerating and stopping to continue point-to-point operation.

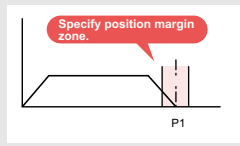
Output pattern

Zone output



Zone for external I/O output can be set for each point.

"Near width" output



"Near width" output zone can be set for each point as a position margin zone where "positioning complete" signal is to be output.

2 Detailed data can be set for each point

Settings such as acceleration, deceleration, zone output range, and position margin zone can be set for each point. Different operations can be easily specified by combining these settings with the above operation patterns.

Setting items

Setting item		Description
1	Run type	Specifies operation pattern such as ABS, INC, positioning, push, and point-to-point link.
2	Position	Specifies position or distance to move.
3	Speed	Specifies maximum speed during operation.
4	Accel.	Specifies acceleration during operation.
5	Decel.	Specifies deceleration during operation (Percentage of acceleration)
6	Push	Specifies motor current limitation during pushing operation.
7	Zone (-)	Specifies upper and lower limits of "personal zone" for each point data.
8	Zone (+)	
9	Near width	Specifies position margin zone where "near width" output should turn on.
10	Jump	Specifies next movement destination after positioning or linked destination for point-to-point operation.
11	Flag	Specifies stop mode and others.
12	Timer	Specifies the waiting time (delay) after positioning completion.

Note:Acceleration and deceleration can be set in easy-to-understand percentage (%) units (standard setup) or in SI units (custom setup) which make it easy to calculate the cycle time.

3 Maximum acceleration auto setting

Acceleration is a critical parameter that determines how long the robot can continue operating (or service life). In worst cases, setting the acceleration too high may cause the robot to breakdown after a short time.
On the TS series, the maximum acceleration is finely set by taking into account the service life span of the motor output and the guide for each robot model and payload. This eliminates any worry about setting the acceleration too high by mistake.

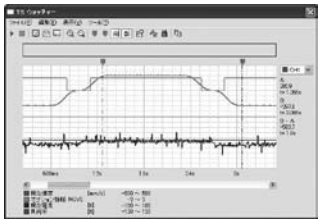
4 Full range of monitor functions

P.411

The TS-Manager developed exclusively for the TS series not only does data write, edit, backup tasks and parameter settings but also comes loaded with cycle-time, simulator, and monitor functions of all types.
A run-distance monitor for maintenance use is provided as a standard unit feature. Design emphasizes easy, user-friendly operation.

Main monitor displays

- Position
- Speed
- Current
- Load factor
- Voltage
- Temperature
- Input information
- Output information



5 LCD monitor showing easy-to-understand operation status display

TS-X　TS-P

A main-unit integrated type LCD monitor is available as an optional unit. The operation status, current position, load factor, and/or error contents can be understood at a glance.

P.405

6 Power supply voltage selectable 100V or 200V

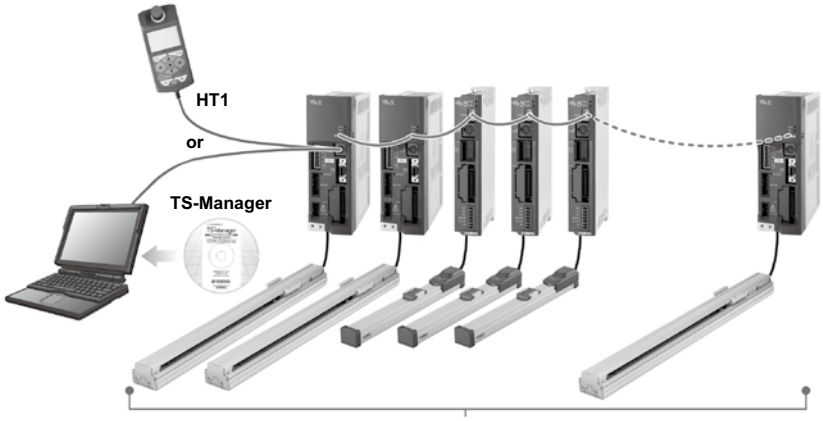
TS-X　TS-P

The power supply voltage for the TS-X and TX-P is selectable from 100V or 200V.

7 Daisy chain function

TS-S TS-X TS-P

This function allows monitoring the various data design and operation status of any controller connected via daisy chain from one PC or handy terminal.



Model Overview

Name	TS-S	TS-X	TS-P
Power	● **Main power supply** DC24V +/-10% maximum ● **Control power supply** DC24V +/-10% maximum	**AC100V specifications** Single phase 100 to 115V +/-10% maximum (50/60Hz) **AC200V specifications** Single phase 200 to 230V +/-10% maximum (50/60Hz)	
Operating method	I/O point tracing / Remote command / Operation using RS-232C communication		
Maximum number of controllable axes	Single-axis		
Position detection method	Incremental	Absolute / Incremental	Incremental / Semi-absolute
Controllable robot	Compact single-axis robot TRANSERVO	Single-axis robot FLIP-X	Linear motor single-axis robot PHASER
Support software for PC	TS-Manager		

Ordering method

● TS-S

TS-S — Controller

I/O
NP: NPN
PN: PNP
CC: CC-Link
DN: DeviceNet

● TS-X / TS-P

TSX — Controller

Controller
TSX: TS-X
TSP: TS-P

Driver: Power-supply voltage / Power capacity
105: 100V / 100W more less
110: 100V / 200W
205: 200V / 100W more less
210: 200V / 200W
220: 200V / 400 to 600W

Regenerative unit
No entry: None
R: With RGT
R: With RGU-2

LCD monitor
No entry: None
L: With LCD

Input/Output Selection
NP: NPN
PN: PNP
CC: CC-Link
DN: DeviceNet

Battery Note1
B: With battery (Absolute model)
N: None (Incremental model)

Note1. Battery can only be selected for TS-X. (Not provided for TS-P).

TS-X / TS-P specification selection table

Some specifications are automatically determined by the robot model.

● TS-X

			T4LH / C4LH	T5LH / C5LH	T6L / C6L	T9	T9H	F8 / C8	F8L / C8L	F8LH / C8LH	F10 / C10	F14 / C14	F14H / C14H	F17 / C17	F17L / C17L	F20 / C20	F20N	N15 / N15D	N18 / N18D	B10	B14	B14H	R5	R10	R20
Power supply voltage / Current sensor	TS-X	105	●	●	●	●		●	●	●	●	●								●	●	●	●	●	
		110					●						●												●
		205	●	●	●	●		●	●	●	●	●								●	●	●	●	●	
		210					●						●												●
		220												●	●	●	●	●	●						
Regenerative unit	No entry (None)				(1)	(2)				(1)	(1)	(2)	(3)		(3)	(4)					(5)			
	R (RGT)				(1)	(2)				(1)	(1)	(2)	(3)	●	(3)	(4)	●	●			(5)			

(1) Regenerative unit is needed if using in a perpendicular position and movement stroke is 700mm or more.
(2) Regenerative unit is needed if using in a perpendicular position.
(3) Regenerative unit is needed if using in a perpendicular position, using at maximum speeds exceeding 1000mm per second, or if using high leads (40).
(4) Regenerative unit is needed if using at maximum speeds exceeding 1000mm per second.
(5) Regenerative unit is needed if using at maximum speeds exceeding 1250mm per second.

● TS-P

			MR12/12D	MF7/7D	MF15/15D	MF20/20D	MF30/30D	MF75/75D
Power supply voltage / Current sensor	TS-P	105	●					
		110		●	●	●		
		205	●					
		210		●	●	●		
		220					●	●
Regenerative unit	No entry (None)		●	●	●			
	R (RGT)					●	●	
	R (RGU-2)							●

TS-S/TS-X/TS-P

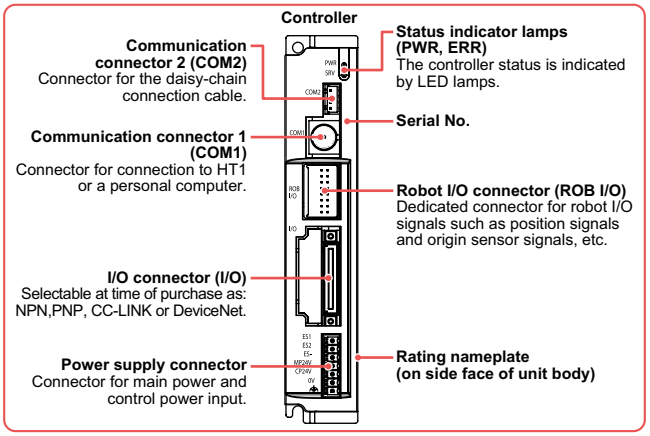
TS-S basic specifications

	Item		Model	TS-S
Basic specifications	Number of controllable axes			Single-axis
	Controllable robots			TRANSERVO series
	Power capacity			70 to 110VA
	Dimensions			W30 × H162 × D82mm
	Weight			Approx. 0.2kg
	Input power supply	Control power supply		DC24V +/-10% maximum
		Motor power supply		DC24V +/-10% maximum
Axis control	Control method			Closed loop vector control method
	Operating method			I/O point tracing (Positioning operation by specifying point number) / Remote command
	Operation types			Positioning, merge-positioning, push, and jog operations
	Position detection method			Resolver
	Resolution			20480 P/rev
	Origin search method			Incremental
Points	Points			255 points
	Point type setting			(1) Standard setting: Set speed and acceleration in percent of the respective maximum settings. (2) Custom setting: Set speed and acceleration in SI units.
	Point teaching method			Manual data input (coordinates input), Teaching, Direct teaching
External input/output	I/O interface			Selectable from the following: NPN, PNP, CC-Link, DeviceNet
	Input			Servo ON (SERVO), reset (RESET), start (START), interlock (/LOCK) origin search (ORG), manual mode (MANUAL), jog motion - (JOG-), jog motion + (JOG+), Point number selection (PIN0 to PIN7)
	Output			Servo status (SRV-S), alarm (/ALM), operation end (END), operation in-progress (BUSY), control outputs (OUT0 to 3), Point number output 0 to 7 (POUT0 to POUT7)
	External communications			RS-232C 1CH
	Safety circuit			Emergency stop input, emergency stop contact output (1 system: When the HT1 is used.)
Options	Handy terminal			HT1, HT1-D (with enable switch)
	Support software for PC			TS-Manager
General specifications	Operating temperature / Operating humidity			0°C to 40°C, 35% to 85%RH (non-condensing)
	Storage temperature/ Storage humidity			-10°C to 65°C, 10% to 85%RH (non-condensing)
	Atmosphere			Indoor location not exposed to direct sunlight. No corrosive , flammable gases, oil mist, or dust particles
	Anti-vibration			All XYZ directions 10 to 57Hz unidirectional amplitude 0.075mm 57 to 150Hz 9.8m/s^2
	Protective functions			Positioning detection error, power module error, temperature abnormality, overload, overvoltage, low voltage, gross position error

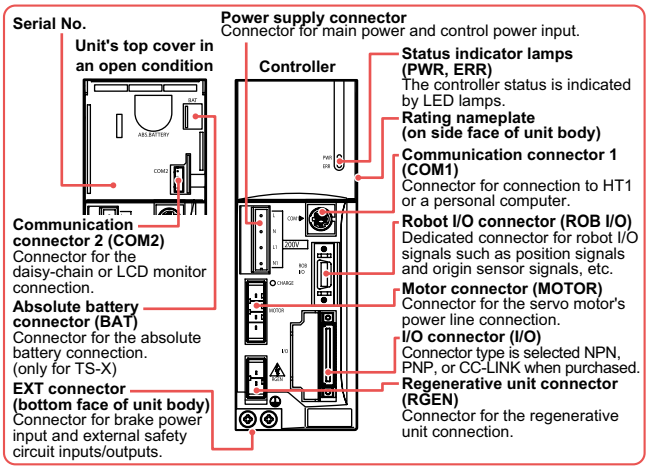
TS-X / TS-P basic specifications

	Item		Model	TS-X / TS-P				
				100V AC input		200V AC input		
Basic specifications	Driver model			TS-X105 / TS-P105	TS-X110 / TS-P110	TS-X205 / TS-P205	TS-X210 / TS-P210	TS-X220 / TS-P220
	Number of controllable axes			Single-axis				
	Controllable robots			TS-X: Single-axis robot FLIP-X series TS-P: Linear motor single-axis robot PHASER series				
	Power capacity			400VA	600VA	400VA	600VA	1400VA
	Dimensions			W58 × H162 × D131mm				W70 × H162 × D131mm
	Weight			Approx. 0.9kg				Approx. 1.1kg
	Input power supply	Control power supply		Single phase AC100 to 115V +/-10% 50/60Hz		Single phase AC200 to 230V +/-10% 50/60Hz		
		Motor power supply		Single phase AC100 to 115V +/-10% 50/60Hz		Single phase AC200 to 230V +/-10% 50/60Hz		
Axis control	Control method			Closed loop vector control method				
	Operating method			I/O point tracing (Positioning operation by specifying point number) / Remote command				
	Operation types			Positioning, merge-positioning, push, and jog operations				
	Position detection method			TS-X: Resolver with multi-rotation absolute function TS-P: Magnetic type linear scale				
	Resolution			TS-X: 16384 P/rev TS-P: 1μm				
	Origin search method			TS-X: Absolute / Incremental TS-P: Incremental / Semi-absolute				
Points	Number of points			255 points				
	Point type setting			(1) Standard setting: Set speed and acceleration in percent of the respective maximum settings. (2) Custom setting: Set speed and acceleration in SI units.				
	Point teaching method			Manual data input (coordinates input) , Teaching, Direct teaching				
External input/output	I/O interface			Selectable from the following: NPN, PNP, CC-Link, DeviceNet				
	Input			Servo ON (SERVO), reset (RESET), start (START), interlock (/LOCK) origin search (ORG), manual mode (MANUAL), jog motion - (JOG-), jog motion + (JOG+), Point number selection (PIN0 to PIN7)				
	Output			Servo status (SRV-S), alarm (/ALM), operation end (END), operation in-progress (BUSY), control outputs (OUT0 to 3), Point number output 0 to 7 (POUT0 to POUT7)				
	External communications			RS-232C 1CH				
	Power supply for brake			DC24V +/-10% 300mA (prepared by the customer)				
	Safety circuit			Emergency stop input, main power input ready output, emergency stop contact output (1 system: When the HT1 is used.)				
Options	Handy terminal			HT1, HT1-D (with enable switch)				
	Support software for PC			TS-Manager				
General specifications	Operating temperature / Operating humidity			0°C to 40°C, 35% to 85%RH (non-condensing)				
	Storage temperature / Storage humidity			-10°C to 65°C, 10% to 85%RH (non-condensing)				
	Atmosphere			Indoor location not exposed to direct sunlight. No corrosive , flammable gases, oil mist, or dust particles				
	Anti-vibration			All XYZ directions 10 to 57Hz unidirectional amplitude 0.075mm 57 to 150Hz 9.8m/s^2				
	Protective functions			Positioning detection error, power module error, temperature abnormality, overload, overvoltage, low voltage, gross position error				
	Protective structure			IP20				

TS-S part names

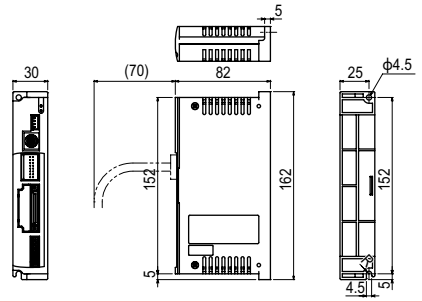

Controller
Communication connector 2 (COM2)
Connector for the daisy-chain connection cable.
Communication connector 1 (COM1)
Connector for connection to HT1 or a personal computer.
I/O connector (I/O)
Selectable at time of purchase as: NPN,PNP, CC-LINK or DeviceNet.
Power supply connector
Connector for main power and control power input.
Status indicator lamps (PWR, ERR)
The controller status is indicated by LED lamps.
Serial No.
Robot I/O connector (ROB I/O)
Dedicated connector for robot I/O signals such as position signals and origin sensor signals, etc.
Rating nameplate (on side face of unit body)

TS-X / TS-P part names

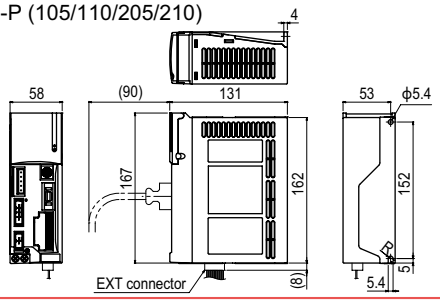

Serial No.
Unit's top cover in an open condition
Power supply connector
Connector for main power and control power input.
Controller
Status indicator lamps (PWR, ERR)
The controller status is indicated by LED lamps.
Rating nameplate (on side face of unit body)
Communication connector 1 (COM1)
Connector for connection to HT1 or a personal computer.
Communication connector 2 (COM2)
Connector for the daisy-chain or LCD monitor connection.
Robot I/O connector (ROB I/O)
Dedicated connector for robot I/O signals such as position signals and origin sensor signals, etc.
Absolute battery connector (BAT)
Connector for the absolute battery connection. (only for TS-X)
Motor connector (MOTOR)
Connector for the servo motor's power line connection.
I/O connector (I/O)
Connector type is selected NPN, PNP, or CC-LINK when purchased.
EXT connector (bottom face of unit body)
Connector for brake power input and external safety circuit inputs/outputs.
Regenerative unit connector (RGEN)
Connector for the regenerative unit connection.

TS-S / TS-X / TS-P dimensions

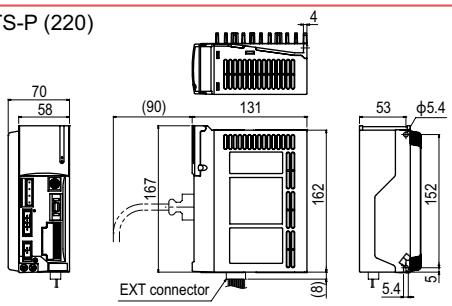
TS-S



TS-X/TS-P (105/110/205/210)



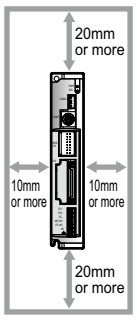
TS-X/TS-P (220)



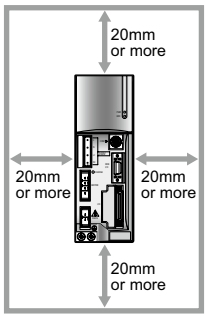
Installation conditions

- Install the TS-S/TS-X/TS-P inside the control panel.
- Install the TS-S/TS-X/TS-P on a vertical wall.
- Install the TS-S/TS-X/TS-P in a well ventilated location, with space on all sides of the TS-S/TS-X/TS-P (See fig. at right.).
- Ambient temperature : 0 to 40˚C
- Ambient humidity : 35 to 85% RH (no condensation)

TS-S



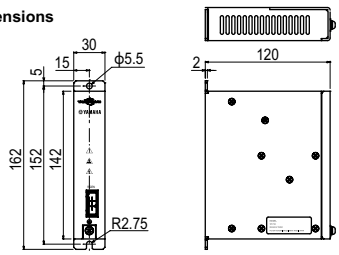
TS-X/TS-P



Regenerative unit RGT/RGU-2

Regenerative unit RGT

Dimensions



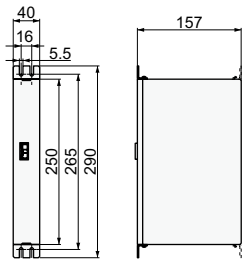
Basic specifications

Item	RGT
Model	KCA-M4107-0A
Dimensions	W30 × H142 × D118mm (Not including installation stay)
Weight	470g
Regenerative voltage	Approx. 420V or more
Regenerative stop voltage	Approx. 380V or less
Accessory	Cable for connection with controller (300mm)

Note. Always leave an empty space (gap of about 20mm) between this unit and the adjacent controller. Also, always use the dedicated cable when connecting the controller.

Regenerative unit RGU-2

Dimensions



Basic specifications

Item	RGU-2 TS-P
Model	KCA-M4107-2A (Including accessory)
Dimensions	W40 × H250 × D157mm
Weight	0.9kg
Regenerative voltage	Approx. 380V or more
Regenerative stop voltage	Approx. 360V or less
Accessory	Cable for connection with controller (300mm)

Note. Always leave an empty space (gap of about 20mm) between this unit and the adjacent controller. Also, always use the dedicated cable when connecting the controller.

Data overview

Point data and parameter data settings must be specified in order to operate a robot from a TS series controller.

Point data

The point data used in positioning operations includes items such as the “RUN type”, “Position”, and “Speed”, etc.
Up to 255 points (P1 to P255) can be registered. There are two point data setting types: “Standard setting” type that automatically defines optimal positioning simply by specifying the payload and “Custom setting” type that allows setting the speed (mm/s) and acceleration (m/s2) in SI units. Select the desired setting type according to the application.

Parameter data

Parameter data is divided into the following categories: “RUN parameters”, “I/O parameters”, “option parameters”, and “servo parameters”.

● Data structure

Data

Point data — **P1 to P255**

1	RUN type	7	Zone (-)
2	Position	8	Zone (+)
3	Speed	9	Near width
4	Accel.	10	Jump
5	Decel.	11	Flag
6	Push	12	Timer

Sets the point data to be used in positioning.
Select the desiredsetting type (“standard setting” or “custom setting”) according to the application.

(1) Standard setting
Optimum positioning is provided simply by specifying the payload.

(2) Custom setting
Speed and acceleration can be set in SI units.

Parameter data

- **K1 to K20** — RUN parameter
  Specifies parameter settings related to positioning and return to-origin operations.
- **K21 to K39** — I/O parameter
  Specifies parameter settings related to terminal assignments and I/O function selection.
- **K80 to K99** — Option parameter
  Specifies parameter settings related to options such as CC-Link, etc.
- **K40 to K79, K100 to ...** — Servo parameter
  Specifies parameter settings specified to the connected robot. These parameters are specified during initial processing.

Point data

Point data item list

P1 to P255		
Item		Description
1	RUN type	Specifies the positioning operation pattern.
2	Position	Specifies the positioning target position or movement amount.
3	Speed	Specifies the positioning speed.
4	Accel.	Specifies the positioning acceleration.
5	Decel.	Specifies the positioning deceleration (as a percentage of the acceleration).
6	Push	Specifies the electrical current limit value for “Push” operations.
7	Zone (-)	Specifies the “personal zone” output range.
8	Zone (+)	
9	Near width	Specifies the “near width” zone (distance tolerance relative to target position).
10	Jump	Specifies the next movement destination, or the next merge operation merge destination point No. following positioning completion.
11	Flag	Specifies other information related to the positioning operation.
12	Timer	Specifies the waiting time (delay) after positioning completion.

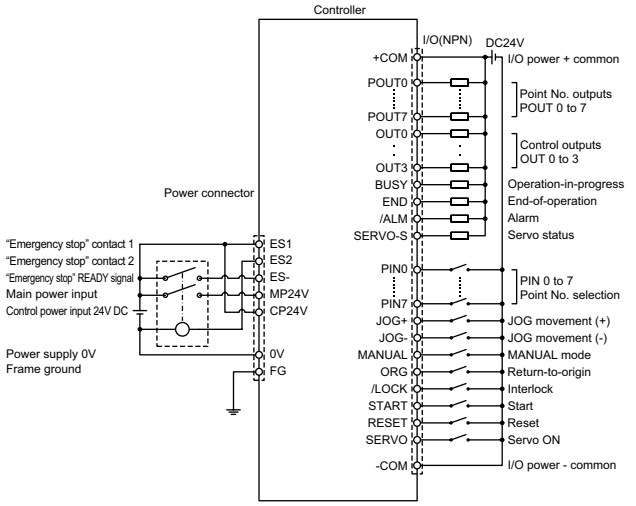
“Standard setting” and “custom setting”

There are 2 setting types for point data (“standard setting” or “custom setting”). Select the desired setting type according to the application.
The maximum number of setting points for both setting types is 255 points (P1 to P255).

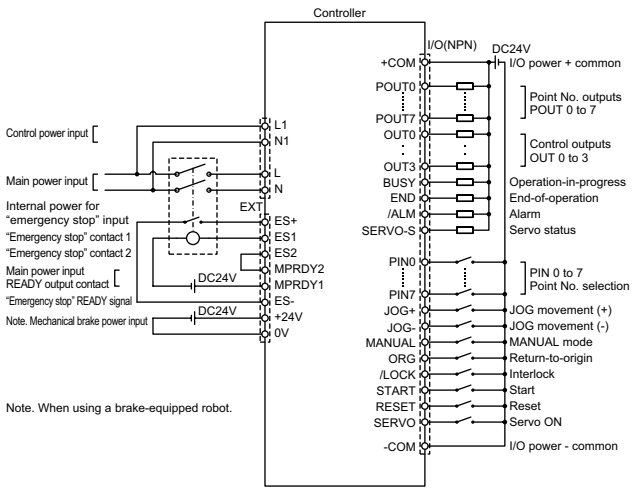
Setting Type	Description
Standard setting	Optimum positioning is provided simply by specifying the payload. This setting type is well-suited to assembly and transport applications.
Custom setting	Allows changing the speed and acceleration in SI units so the desired positioning operation can be set. This setting type is suited for machining and inspection systems.

NPN type input / output wiring diagram

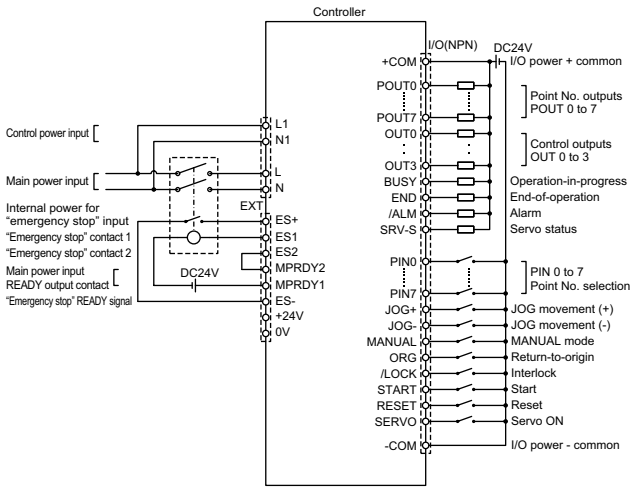
TS-S



TS-X

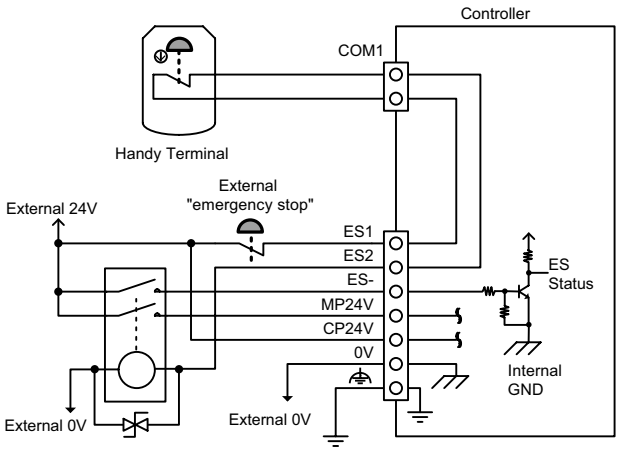


TS-P

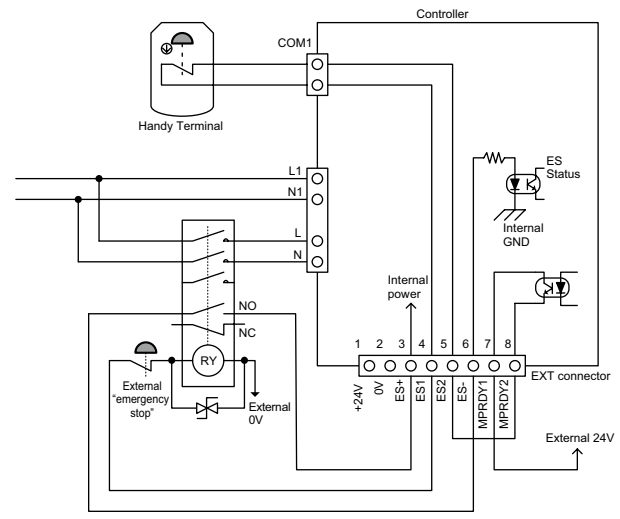


Emergency stop circuit example

TS-S (power connector and host unit connection example)



TS-X / TS-P (EXT connector and host unit connection example)



Note. Always connect a surge absorber unit to the coil on the electromagnetic contactor.

Installing an external safety circuit will satisfy safety category class 4 standards. See P.483 for more information.

I/O Specifications

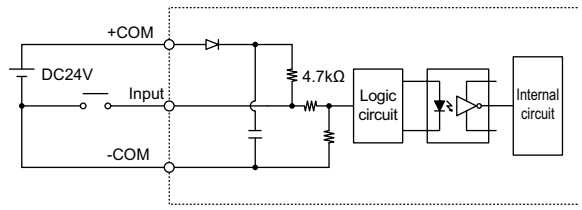
Item	Description
NPN	Input 16 points, 24VDC +/-10%, 5.1mA/point, positive common Output 16 points, 24VDC +/-10%, 50mA/point, sink type
PNP	Input 16 points, 24VDC +/-10%, 5.5mA/point, minus common Output 16 points, 24VDC +/-10%, 50mA/point, source type
CC-Link	CC-Link Ver.1.10 compatible, Remote station device (1 node)
DeviceNet	DeviceNet Slave 1 node

I/O signals (NPN / PNP)

No.	Signal Name	Description		No.	Signal Name	Description	
A1	+COM	I/O power input, positive common (24VDC +/-10%)		B1	POUT0	Outputs	Point No. outputs
A2				B2	POUT1		
A3	NC	No connection		B3	POUT2		
A4	NC			B4	POUT3		
A5	PIN0	Inputs	Point No. select	B5	POUT4		
A6	PIN1			B6	POUT5		
A7	PIN2			B7	POUT6		
A8	PIN3			B8	POUT7		
A9	PIN4			B9	OUT0		OUT0 to OUT3 assignments include: • Zone output • Personal zone output • MANUAL mode status • Return-to-origin end status • NEAR output • Movement-in-progress • Push status • Warning output
A10	PIN5			B10	OUT1		
A11	PIN6			B11	OUT2		
A12	PIN7			B12	OUT3		
A13	JOG+		JOG movement (+ direction)	B13	BUSY		Operation-in-progress
A14	JOG-		JOG movement (- direction)	B14	END		Operation-end
A15	MANUAL		MANUAL mode	B15	/ALM		Alarm
A16	ORG		Return-to-origin	B16	SRV-S		Servo status
A17	/LOCK		Interlock	B17	NC	No connection	
A18	START		Start	B18	NC		
A19	RESET		Reset	B19	-COM	I/O power input, negative common (0V)	
A20	SERVO		Servo ON	B20			

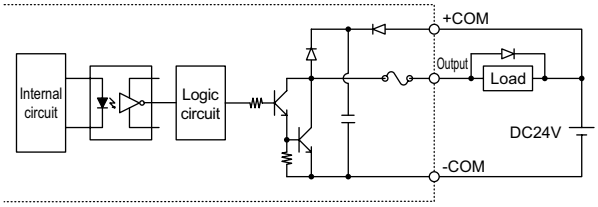
NPN type I/O circuit details

Input circuit



Type : DC input (plus common type)
Photo-coupler isolation format
Load : 24VDC +/- 10%, 5.1mA
OFF voltage : 19.6Vmin (1.0mA)
ON voltage : 4.9Vmax (4.0mA)

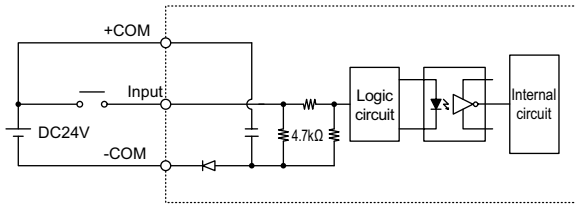
Output circuit



Type : NPN open collector output
(Minus common type)
Photo-coupler isolation format
Load : 24VDC, 50mA/point

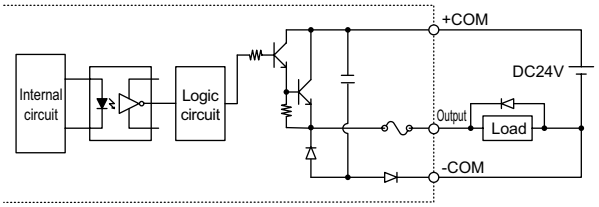
PNP type I/O circuit details

Input circuit



Type : DC input (minus common type)
Photo-coupler isolation format
Load : 24VDC +/- 10%, 5.5mA
ON voltage : 19.6Vmin (4.5mA)
OFF voltage : 4.9Vmax (1.1mA)

Output circuit



Type : PNP open collector output
(Plus common type)
Photo-coupler isolation format
Load : 24VDC, 50mA/point

Accessories and part options

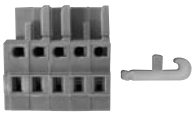
Standard accessories

Power connector

TS-S
TS-SD

Model	KCC-M4421-00

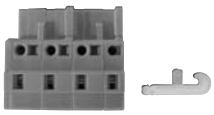
Power connector (AC100V specifications)



TS-X
TS-P

Model	KCA-M5382-00

Power connector (AC200V specifications)



TS-X
TS-P

Model	KAS-M5382-00

EXT connector

For braking power and safety circuit connections.

TS-X
TS-P

Model	KCA-M5370-00

Dummy connector

TS-S
TS-X
TS-P

Model	KCA-M5163-00

I/O cables (2m)

TS-S
TS-X
TS-P

Model	KCA-M4421-20

Absolute battery

TS-X

Model	KCA-M53G0-10

Absolute battery basic specifications

Item	Absolute battery
Model	KCA-M53G0-10
Battery type	Lithium metallic battery
Battery capacity	3.6V / 1,650mAh
Data holding time	About 1 year (in state with no power applied)
Dimensions	ϕ18 × L50mm
Weight	24g

Note. The absolute battery is subject to wear and requires replacement. If trouble occurs with the memory then remaining battery life is low so replace the absolute battery. The battery replacement period depends on usage conditions. But generally you should replace the battery after about 1 year counting the total time after connecting to the controller and left without turning on the power.

Options

Handy terminal HT1 / HT1-D

Has graphic LCD display with backlight for easy viewing.

TS-S
TS-X
TS-P

		HT1	HT1-D
Model	3.5m	KCA-M5110-0E	KCA-M5110-1E
	10m	KCA-M5110-6E	KCA-M5110-7E
Enable switch		–	3-position
CE marking		Not supported	Applicable

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TS-Monitor (LCD monitor)

A liquid crystal display is integrated into this unit. It allows checking each operating state, current position, electrical current and voltage values, etc.

TS-X
TS-P

Model	For TS-X	KCA-M5119-00
	For TS-P	KCA-M5119-10

P.405

Support software TS-Manager

Besides data writing, editing and backup functions, the TS-Manager also offers cycle time simulation and various types of monitor functions.

TS-S
TS-X
TS-P
TS-SD

Model	KCA-M4966-00

TS-Manager environment

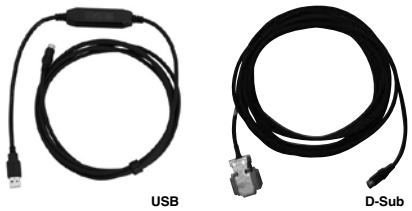
OS	Microsoft Windows 2000/ XP/Windows Vista/7
CPU	Exceeding the environment recommended by the OS being used
Memory	Exceeding the environment recommended by the OS being used
Hard disk	Vacant capacity of more than 20MB in the installation destination drive
Communication port	Serial (RS-232C), USB
Applicable controllers	TS-S / TS-X / TS-P / TS-SD

Note. Windows is the registered trademark of US Microsoft Corporation in U.S.A. and other countries.

P.411

Data cables

Communication cable for TS-Manager.
Select from USB cable or D-sub cable.



Model	USB type (5m)	KCA-M538F-A0
	D-Sub type (5m)	KCA-M538F-01

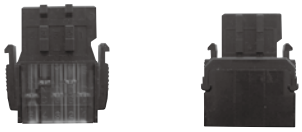
Note. USB driver for communication cable can also be downloaded from our website (driver supports VIP+, POPCOM, and TS-Manager).

Daisy chain coupler cable

TS-S
TS-X
TS-P
TS-SD

Model	KCA-M532L-00

CC-Link connector



Model	Connector Note.	KCA-M4872-00
	Jump socket	KCA-M4873-00

Note. This is a single connector type. (Insert two connectors into a branching socket.)

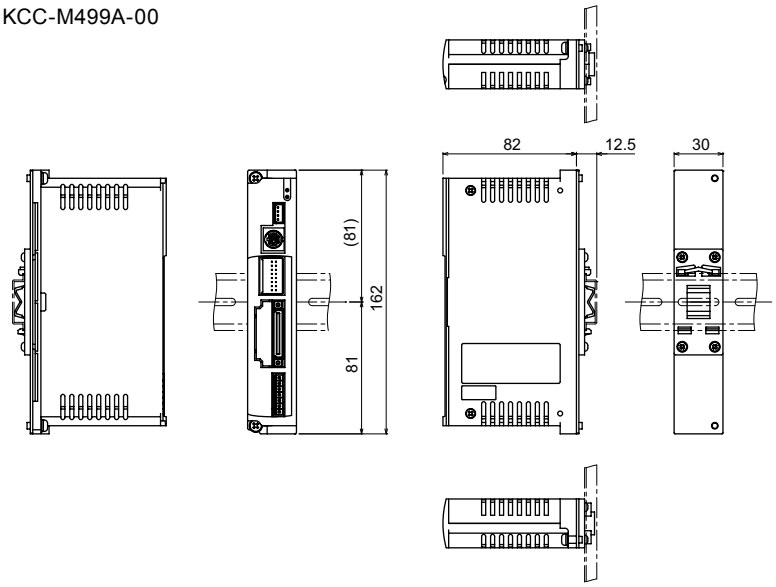
Options

DIN rail mounting bracket

TS-S

Model	For TS-S
	KCC-M499A-00

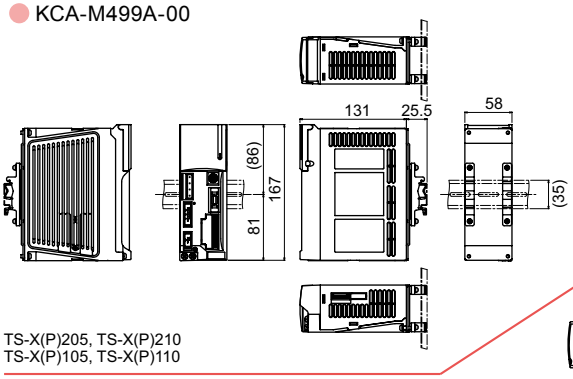
KCC-M499A-00



TS-X
TS-P

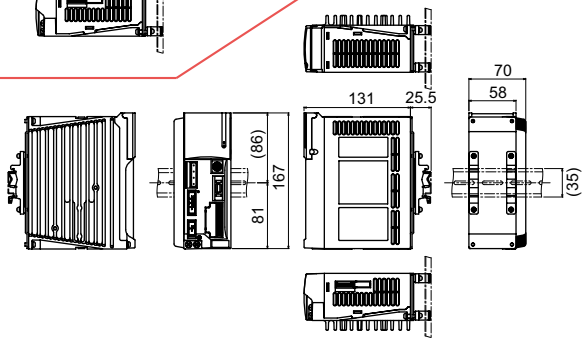
Model	For TS-X / TS-P
	KCA-M499A-00

KCA-M499A-00



TS-X(P)205, TS-X(P)210
TS-X(P)105, TS-X(P)110

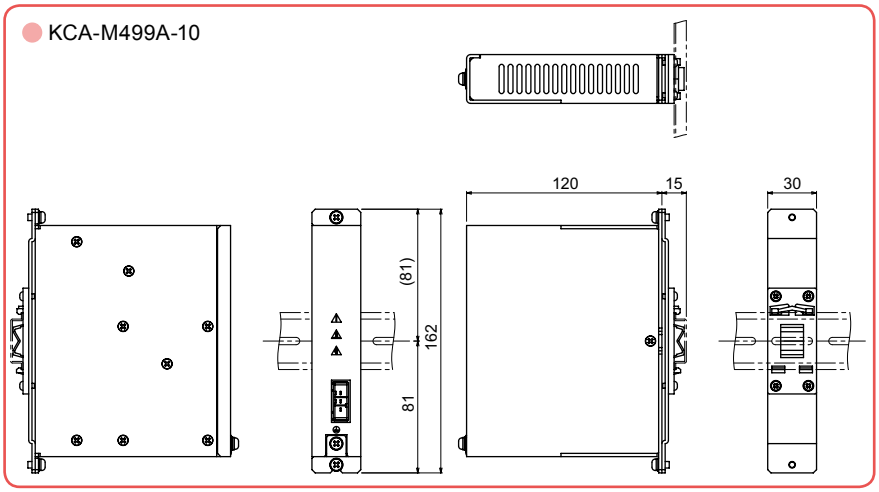
TS-X(P)220



TS-X
TS-P

Model	For TS-X / TS-P with RGT
	KCA-M499A-10

KCA-M499A-10



LCD Monitor option

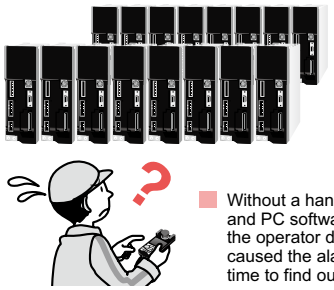
TS-Monitor

Applicable controllers ▶ TS-X TS-P

Integrated into the controller unit, the TS-monitor needs no connections to the handy terminal or PC and checks operation status, current position, error information, etc. The TS-monitor even allows the operator on the scene or service personnel to easily check the controller status. Total operating time is also displayed which is convenient to schedule maintenance periods.

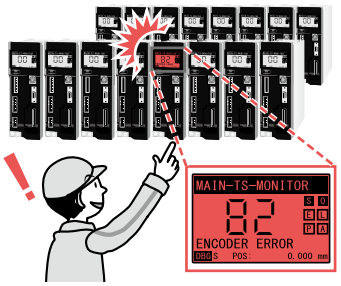
The TS Monitor Advantage

Before installing TS Monitor



- Without a handy terminal "HT1" and PC software "TS-Manager", the operator does not know what caused the alarm and it takes a time to find out the cause.

After installing TS-Monitor

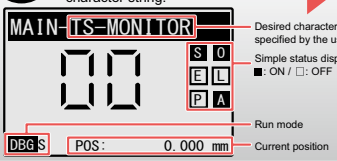


- Operator instantly knows various information without hooking to a handy terminal or PC.
- During errors the backlit display turns red and operator can see what error occurred on what controller at a glance.
- Display shows total operating time, so scheduling maintenance periods is easy.
- Backlit display is bright and easy to read even on dark panels.

Features

MAIN screen — Shows basic info

in normal operation — Displays optional name or character string.

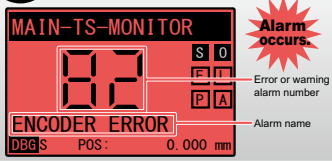


- Desired character string specified by the user.
- Simple status display ■: ON / □: OFF
- Run mode
- Current position

Error

MAIN screen — Easy to see error messages

in case of alarm — Red backlit display appears during alarms.



Alarm occurs.

- Error or warning alarm number
- Alarm name

■ Simple status display

Display	Meaning
S	Servo status
E	Emergency stop
P	Main power failure
O	Return-to-origin completion status
L	Interlock status
A	Alarm

■ Run mode

Display	Meaning
NRM	Normal mode
MON	Monitor mode
DBG	Debug mode

I/O screen — Shows I/O status

Displays input/output bit states.

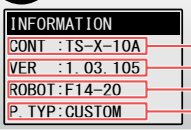
- Input signal status * Displays the status of input bit 0 to 15.
- Output signal status * Displays the status of output bit 0 to 15.

■ Bit signal correspondence table

	F	E	D	C	B	A	9	8
IN	SERVO	RESET	START	/LOCK	ORG	MANUAL	JOG-	JOG+
	7	6	5	4	3	2	1	0
	PIN7	PIN6	PIN5	PIN4	PIN3	PIN2	PIN1	PIN0
	F	E	D	C	B	A	9	8
OUT	SRV-S	/ALM	END	BUSY	OUT3	OUT2	OUT1	OUT0
	7	6	5	4	3	2	1	0
	POUT7	POUT6	POUT5	POUT4	POUT3	POUT2	POUT1	POUT0

INFORMATION screen — Shows machine info

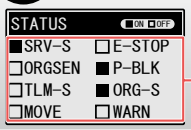
Displays the connected robot and version.



- Controller name
- Controller software version
- Robot name
- Point type

STATUS screen — Shows status info

Info such as error status or movement status is all at a glance.



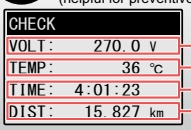
Status display ■: ON, □: OFF

■ Status display

Display	Meaning
SRV-S	Servo status
ORGSEN	Origin sensor
TLM-S	Push status
MOVE	Move status
E-STOP	Emergency stop
P-BLK	Main power failure
ORG-S	Return-to-origin completion status
WARN	Warning output

CHECK screen — Shows operating status

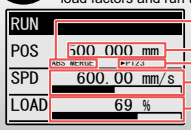
Displays total drive distance (helpful for preventive maintenance).



- Internal voltage of controller
- Temperature inside controller
- Total startup time of controller (Day : Hour : Minute)
- Total movement distance of robot

RUN screen — Shows operation status and data

Info includes position, speed, load factors and run type.

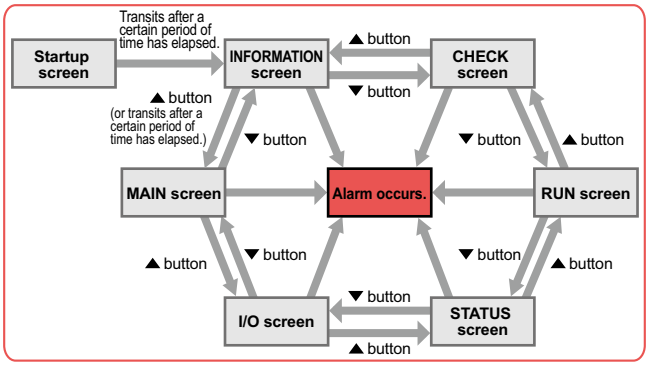


- Run type
- Robot current position
- Run point
- Robot operation speed
- Load rate

■ Run type

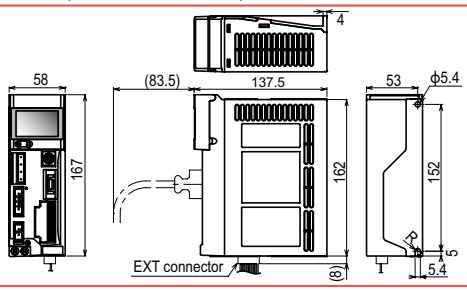
Display	Meaning
HOLD	Servo is off or robot is stopping
ABS	ABS
INC	INC
ABS MERGE	ABS merge operation
INC MERGE	INC merge operation
ABS PUSH	ABS push operation
INC PUSH	INC push operation
ABS->PUSH	ABS deceleration push operation
INC->PUSH	INC deceleration push operation
ORG	Return-to-origin

Screen transition

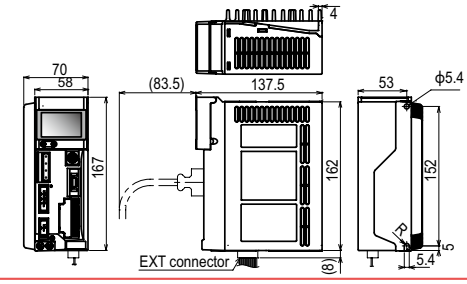


Dimensions

TS-X/TS-P (105/110/205/210) with TS-Monitor



TS-X/TS-P (220) with TS-Monitor



TS-Monitor basic specifications

Model	TS-X	KCA-M5119-00
	TS-P	KCA-M5119-10
Effective display size		W40.546 × H25.63mm
Screen display		Graphic monochrome LCD
Backlight		Blue and red, 2-color LCD
Contrast adjustment		5 steps
Number of display dots		128 × 64 dots

Handy terminal

HT1/HT1-D

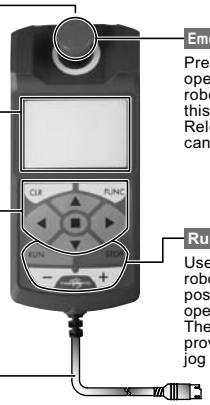
Applicable controllers ▶ TS-S TS-X TS-P

This Handy Terminal is a device that can perform any operation such as robot manual operation, point data edit, teaching, and parameter setting, etc. Has graphic LCD display with backlight for easy viewing.

HT1 / HT1-D basic specifications

Name		HT1	HT1-D
External view			
Applicable controllers		TS-S / TS-X / TS-P	
Model	Japanese specifications	KCA-M5110-0J(3.5m) KCA-M5110-6J(10m)	KCA-M5110-1J(3.5m) KCA-M5110-7J(10m)
	English specifications	KCA-M5110-0E(3.5m) KCA-M5110-6E(10m)	KCA-M5110-1E(3.5m) KCA-M5110-7E(10m)
Display		Dot matrix monochrome display (with backlighting) 32 characters × 10 lines	
Operation keys		Mechanical switch	
Emergency stop button		Normally closed contact point (with lock function)	
Enable switch		-	3-position
Safety connector		-	15 pin D-sub connector (male)
CE marking		Not supported	Applicable
Operating temperature		0°C to 40°C	
Operating humidity		35% to 85%RH (non-condensing)	
Dimensions		W88 × H191 × D45mm (Emergency stop button not included.)	
Weight		260g (not including cable)	300g (not including cable)
Cable length		3.5m / 10m	

Part names and function



Strap holder
Attaching a short strap or necklace strap here prevents dropping the HT1 while operating it or installing it onto equipment.

LCD screen
This is a liquid crystal display (LCD) screen with 32 characters × 10 lines (pixel display), showing the operation menus and various types of information.

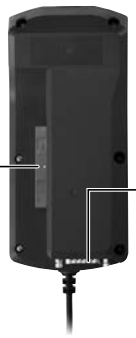
Data edit keys
Use these keys to select menus and edit various data.

Connector cable
This cable connects to the controller. One end of this cable is terminated with an 8-pin MD connector (male). Plug this cable into the COM1 connector on the controller front panel.

Emergency stop button
Pressing this button during operation immediately stops robot movement. To release this button, turn it clockwise. Releasing this button also cancels emergency stop.

Run/stop keys
Use these keys to operate the robot for teaching or positioning, or to stop operation.
The ⊖ and ⊕ keys are also provided to move the robot in jog mode.

HT1-D rear side



Enable switch (only on HT1-D)
This switch is effective for use with remote safety circuits. This switch cuts off the circuit when pressed or released but allows circuit operation when in the middle position.

Safety connector (only on HT1-D)
Use with remote safety circuits triggered by the emergency stop button or enable switch.

Field network system with minimal wiring

NETWORK

Applicable controllers ▶ TS-S TS-X TS-P

Network modules CC-Link

- Option unit with networking functions that can be incorporated in YAMAHA robot controllers, TS-S / TS-X / TS-P.
- As connection of the robot system and the sequencer requires only one (4-wire) dedicated cable, it is possible to save wiring of the entire system, which contributes to efficient wiring work, reduction of installation and maintenance costs, etc.
- 16 input/outputs usable as I/O.
- Operation occurs as a CC-Link remote device station, on a one-unit to one-station basis.
- Remote commands can read or write point data and load each type of status.

Basic specifications for network modules CC-Link

Item	Network modules CC-Link
Applicable controllers	TS-S / TS-X / TS-P
Version supporting CC-Link	Ver. 1.10
Remote node type	Remote device node
Number of occupied nodes	1 node
Node number setting	1 to 64
Communication speed setting	10Mbps, 5Mbps, 2.5Mbps, 625Kbps, 156Kbps
No. of CC-Link inputs/outputs	Input 16 points , Output 16 points
Shortest distance between nodes[Note1]	0.2m or more
Overall extension distance[Note1]	100m/10Mbps, 160m/5Mbps, 400m/2.5Mbps, 900m/625Kbps, 1200m/156Kbps
Monitor LED	L RUN, L ERR, SD, RD

Note 1. These values apply when a cable that supports CC-Link Ver.1.10 is used.

Network modules DeviceNet

- Option unit with networking functions that can be incorporated in YAMAHA robot controllers, TS-S / TS-X / TS-P.
- As connection of the robot system and the sequencer requires only one (4-wire) dedicated cable, it is possible to reduce wiring of the entire system, which contributes to efficient wiring work, reduction of installation and maintenance costs, etc.
- 16 input/outputs usable as I/O.
- Operate as slave stations, with each unit occupying 6 input and 6 output channels.
- Remote commands can read or write point data and load each type of status.

Basic specifications for network modules DeviceNet

Item		Network modules DeviceNet
Applicable controllers		TS-S / TS-X / TS-P
Applicable DeviceNet specifications		Volume 1 Release2.0/Volume 2 Release2.0
Device type		Generic Device (device number 0)
Number of occupied CH		Input 6ch, Output 6ch
MAC ID setting		0 to 63
Communication speed setting		500Kbps, 250Kbps, 125Kbps
DeviceNet inputs/outputs		Input 16 points, Output 16 points
Network length	Overall extension distance	100m/500Kbps, 250m/250Kbps, 500m/125Kbps
	Branch length	6m or less
	Overall branch length	39m or less/500Kbps, 78m or less/250Kbps, 156m or less/125Kbps
Monitor LED		Module, Network

Touch operator interface

Pro-face GP4000 Series

Applicable controllers ▶ TS-S TS-X TS-P

Free download of the program file from the Pro-face home page
http://www.proface.com

Connecting GP4000 Series made by Pro-face to Robot Positioner, TS-S,TS-X,TS-P enables you to use a lot of functions as well as basic operations on Touch Operator Interface.

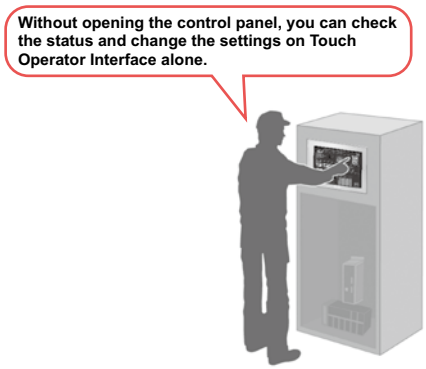
Features

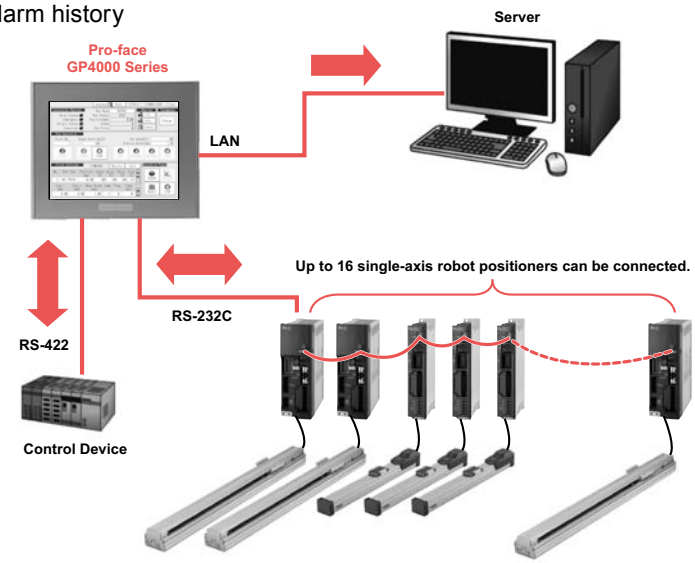
1 Can easily check a state and change settings.

- Check the status (the current position, speed etc)
- Basic operations such as Jog operation, inching operation, return to origin, error reset etc.
- Set, edit, or back up point data and parameters
- Check triggered alarms and detailed descriptions of alarm history

2 Supports 3 languages

- Supports Japanese, English, and Chinese (simplified, traditional)

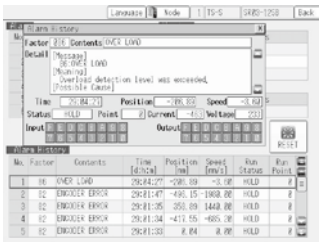




Screen details

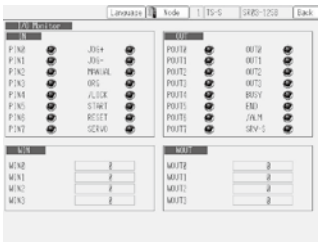
Diagnostic Screen

When a problem occurs, you can check the detailed descriptions of the alarm history, so you can understand easily what the cause is.



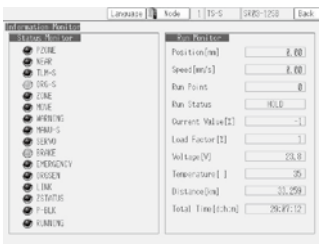
I/O Monitor Screen

Displays both general I/O and dedicated I/O together. You can quickly check the I/O status.



Information Monitor Screen

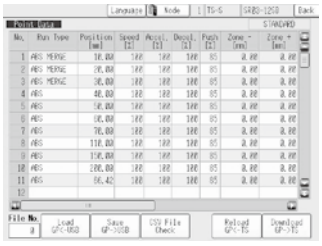
The screen can display the robot status and the operation status. You can check immediately the robot condition.



Position Data Editing Screen

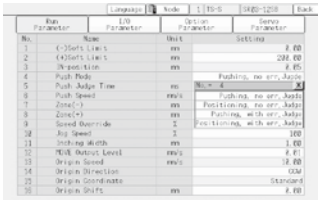
You can edit and back up point data (255 points).[Note]

Note. Settings for it and a USB storage required.



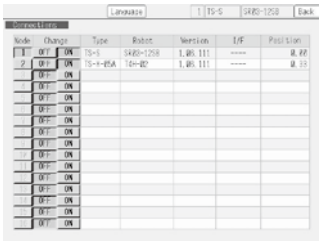
Parameter Editing Screen

While checking parameters of robot positioners in the list, you can set them with the pull-down menu.



Connecting Selection Screen

You can connect up to 16 robot positioners simultaneously with GP-Pro EX Ver.3.0 multi-axis feature.



Contact; Pro-face TEL:06-6613-1101 FAX:06-6613-5888

Single axis

TS-SD

Robot driver | Only for pulse train control | CE compliance | Dedicated for TRANSERVO

The TS-SD is a high-performance robot driver specifically designed for the TRANSERVO series that supports pulse train command input.

TS-SD

Features

1 Pulse train input driver for single-axis robot “TRANSERVO”

Robot driver that supports pulse train input has now been added for YAMAHA single-axis robot “TRANSERVO”.

2 Uses vector control

Design based on the TS-S robot positioner allows easy control combining the best points of servos and stepping motors. This reduces a torque decrease in the high-speed range and achieves a high level of quietness.

3 Closed loop control by resolver

High resolution of 20480 pulses per revolution and closed loop control eliminate step-out unique to high precision positioning and stepping motor.

4 Supports a wide range of pulse train control

Supports open collector and line driver methods selectable by parameter setting and signal wiring connection.
The open collector method is compatible with a wide voltage range from 5 to 24 V, and easily matches specs of the host device you want to use.

5 Operable with the TS-Manager software for the TS series

The TS-SD can be operated with the TS-Manager software (Ver. 1.3.0 or later) having a full range of functions including robot parameter setting, backup, and real-time trace the same as on the TS series controllers.

Note. The handy terminal “HT1” cannot be used with the TS-SD.

Model Overview

Name	TS-SD
Power	● Main power supply DC24V +/-10% maximum ● Control power supply DC24V +/-10% maximum
Operating method	Pulse train control
Maximum number of controllable axes	Single-axis
Position detection method	Incremental
Controllable robot	Dedicated compact single-axis TRANSERVO
Support software for PC	TS-Manager

Ordering method

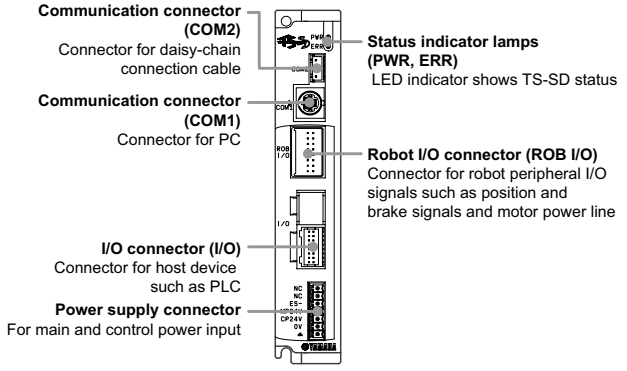
● Controller only ● Robot + Controller

TS-SD Note – [ ] – [ ] – **SD** **1**

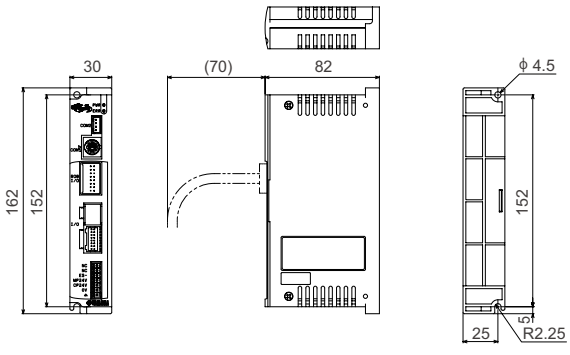
TS-SD	Robot model	Cable length	SD	1
Controller	TRANSERVO Series	1L: 1 meter 3L: 3 meters 5L: 5 meters 10L: 10 meters (flexible cables)	Controller	I/O cable 1L: 1 meter

Note. I/O cable (1 meter) comes supplied with unit.

Part names / dimensions


Communication connector (COM2)
Connector for daisy-chain connection cable
Communication connector (COM1)
Connector for PC
I/O connector (I/O)
Connector for host device such as PLC
Power supply connector
For main and control power input
Status indicator lamps (PWR, ERR)
LED indicator shows TS-SD status
Robot I/O connector (ROB I/O)
Connector for robot peripheral I/O signals such as position and brake signals and motor power line

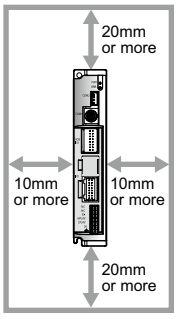
● TS-SD



Installation conditions

- Install the TS-SD inside the control panel.
- Install the TS-SD on a vertical wall.
- Install the TS-SD in a well ventilated location, with space on all sides of the TS-SD (See fig. at right.).
- Ambient temperature : 0 to 40˚C
- Ambient humidity : 35 to 85% RH (no condensation)

● TS-SD



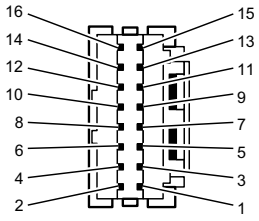
Basic specifications

	Item	Model	TS-SD
Basic specifications	Number of controllable axes		Single-axis
	Controllable robots		TRANSERVO series
	Maximum power consumption		70 to 110VA
	Dimensions		W30 × H162 × D82mm
	Weight		Approx. 0.2kg
	Input power supply	Control power supply	DC24V +/-10%
		Main power supply	DC24V +/-10%
Axis control	Operating method		Pulse train control
	Control method		Closed loop vector control method
	Position detection method		Resolver
	Resolution		20480 P/rev
	Origin search method		Incremental
External input/output	Pulse train command input		Line driver method : 500 kpps or less
			Open collector method : 100 kpps or less (DC5 to 24V +/- 10%)
	Input		Servo ON (SERVO), reset (RESET) origin search (ORG)
	Output		Servo status (SRV-S), alarm (/ALM), positioning completion (IN-POS), return-to-origin end status (ORG-S)
	External communications		RS-232C 1CH
Options	Support software for PC		TS-Manager
General specifications	Operating temperature		0°C to 40°C
	Storage temperature		-10°C to 65°C
	Operating humidity		35% to 85%RH (non-condensing)
	Storage humidity		10% to 85%RH (non-condensing)
	Atmosphere		Indoor location not exposed to direct sunlight. No corrosive , flammable gases, oil mist, or dust particles
	Anti-vibration		All XYZ directions 10 to 57Hz, unidirectional amplitude 0.075mm 57 to 150Hz 9.8m/s^2
	Protective functions		Position detection error, overheat, overload, overvoltage, low voltage, position deviation, control power voltage drop, overcurrent, motor current error, CPU error, motor line disconnection, command speed over, pulse frequency over

I/O signal table

No.	Signal Name	Description
1	+COM	I/O power supply input (DC 24V +/- 10%)
2	OPC	Open collector power supply input
3	PULS1	Command pulse input 1
4	PULS2	Command pulse input 2
5	DIR1	Command direction input 1
6	DIR2	Command direction input 2
7	ORG	Return-to-origin
8	NC	Prohibited to use this signal.
9	RESET	Reset
10	SERVO	Servo ON
11	ORG-S	Return-to-origin end status
12	IN-POS	Positioning completion
13	/ALM	Alarm
14	-COM	I/O power supply input (0V)
15	SRV-S	Servo status
16	FG	Ground

I/O connector



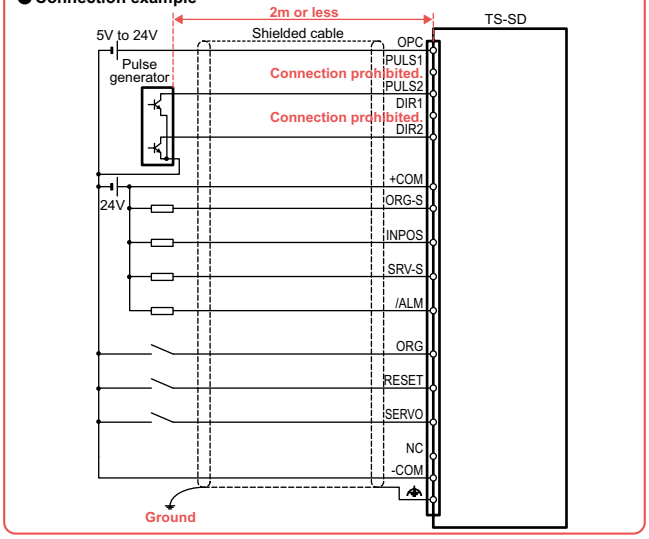
I/O signal list

Type	Signal Name	Open collector	Line driver	Description
Inputs	OPC	Open collector power supply input	(Connection prohibited. Note 2)	Input the power supply for the open collector. (DC5 to 24V +/- 10%)
	PULS1	(Connection prohibited. Note 1)	Command pulse input (+)	Input terminal for pulse train input commands. Select from 3 command forms by changing parameters. • Phase A/Phase B input • Pulse/Sign input • CW/CCW input
	DIR1	(Connection prohibited. Note 1)	Command direction input (+)	
	PULS2	Command pulse input	Command pulse input (-)	
	DIR2	Command direction input	Command direction input (-)	
	ORG	Return-to-origin	←	Starts return-to-origin when ON and stops it when OFF.
	RESET	Reset	←	Alarm reset
	SREVO	Servo ON	←	ON: servo on; OFF: servo off.
Outputs	ORG-S	Return-to-origin end status	←	ON at return-to-origin end.
	IN-POS	Positioning completion	←	ON when accumulated pulse in deviation counter are within specified value range.
	/ALM	Alarm	←	ON when normal. OFF when alarm occurs.
	SRV-S	Servo status	←	ON when servo is on.

Note 1. When using the open collector specifications, do not connect any signal to the PULS1 and DIR1 terminals. Doing so may cause the driver to malfunction or breakdown.
Note 2. When using the line driver specifications, do not connect any signal to the OPC terminal. Doing so may cause the driver to malfunction or breakdown.

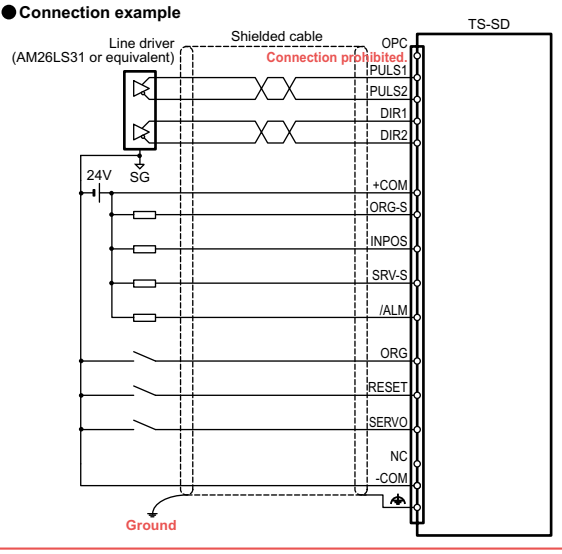
Input / output signal connection diagram [open collector]

● Connection example



Input / output signal connection diagram [line driver]

● Connection example

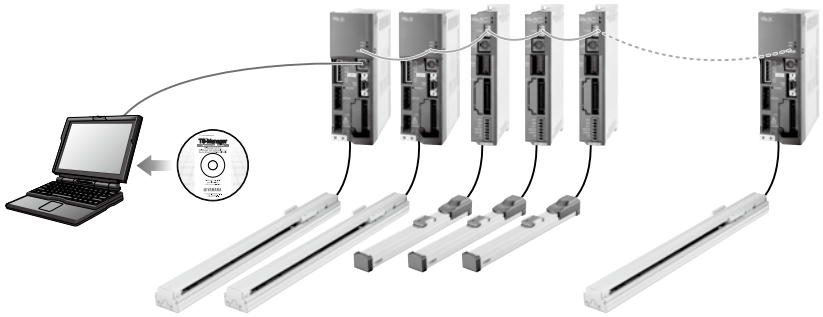


TS-SD

Daisy chain function

Connecting two or more TS series controllers and drivers in a daisy chain allows editing data on any one unit from a PC.

- Up to 16 units connectable
- Requires daisy chain coupler cables.



Accessories and part options

Standard accessories

Power connector

TS-S
TS-SD

Model	KCC-M4421-00

I/O cables (1m)

TS-SD

Model	KCC-M5362-00

Options

Support software TS-Manager

Besides data writing, editing and backup functions, the TS-Manager also offers cycle time simulation and various types of monitor functions.

TS-S
TS-X
TS-P
TS-SD

Model	KCA-M4966-0E

Data cables

Communication cable for TS-Manager.
Select from USB cable or D-sub cable.

USB

D-Sub

Model	USB type (5m)	KCA-M538F-A0
	D-Sub type (5m)	KCA-M538F-00

Note. USB driver for communication cable can also be downloaded from our website (driver supports VIP+, POPCOM, and TS-Manager).

Daisy chain coupler cable

TS-S
TS-X
TS-P
TS-SD

Model	KCA-M532L-00

TS-Manager environment

OS	Microsoft Windows 2000/XP/Windows Vista/7
CPU	Exceeding the environment recommended by the OS being used
Memory	Exceeding the environment recommended by the OS being used
Hard disk	Vacant capacity of more than 20MB in the installation destination drive
Communication port	Serial (RS-232C), USB
Applicable controllers	TS-S / TS-X / TS-P / TS-SD

Note. Windows is the registered trademark of US Microsoft Corporation in U.S.A. and other countries.

P.411

Support software for PC

TS-Manager

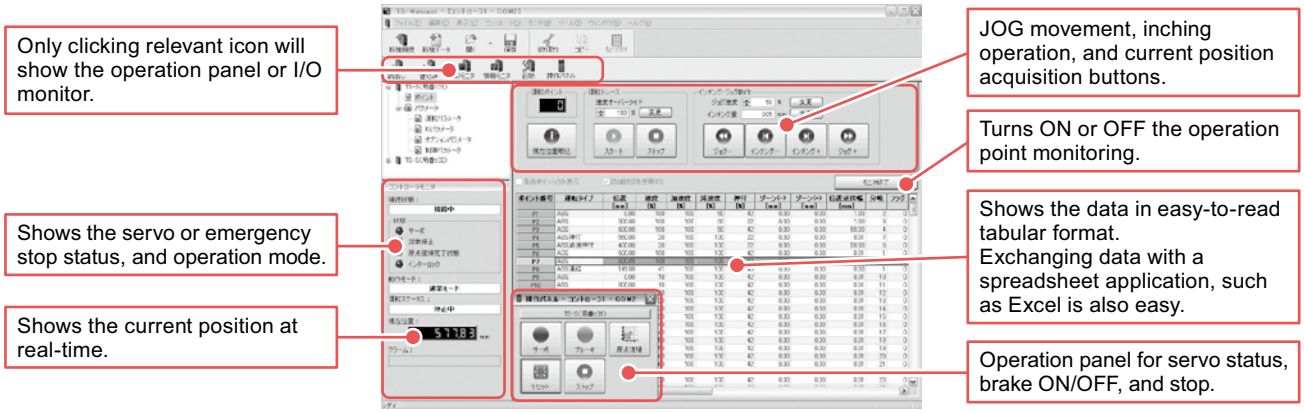
Applicable controllers ▶ TS-S TS-X TS-P TS-SD

Besides basic functions, such as point data edit and backup, this support software TS-Manager incorporates various convenient functions to efficiently process the system debugging and analysis. The TS-Manager helps you in every scene from the system setup to the maintenance.

Features

1 Basic functions

Detailed settings by point, such as the position information, operation pattern, speed, acceleration, and deceleration settings, and robot parameter settings can be set, edited, and backed up. Additionally, the basic operation of the robot, such as JOG movement or inching operation can also be controlled through the TS-Manager.


Only clicking relevant icon will show the operation panel or I/O monitor.
Shows the servo or emergency stop status, and operation mode.
Shows the current position at real-time.
JOG movement, inching operation, and current position acquisition buttons.
Turns ON or OFF the operation point monitoring.
Shows the data in easy-to-read tabular format. Exchanging data with a spreadsheet application, such as Excel is also easy.
Operation panel for servo status, brake ON/OFF, and stop.

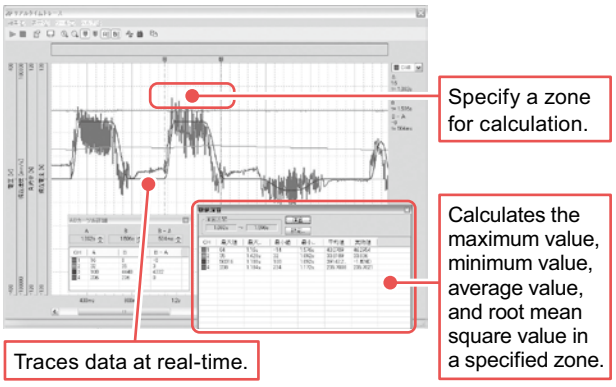
Note. Excel is a registered trademark of Microsoft Corporation in the United States and/or other countries.

2 Real-time trace

This function traces the current position, speed, load factor, current value, and voltage value at real-time. Additionally, as trigger conditions are set, data can be automatically obtained when these conditions are satisfied. Furthermore, as a zone is specified from the monitor results, the maximum value, minimum value, and average value can be calculated. These values are useful for the analysis if a trouble occurs.

Real-time traceable items (up to four items)		
• Voltage value	• Commanded position	• Current position
• Command speed	• Current speed	• Internal temperature
• Command current value	• Present current value	• Motor load factor
• Input/output I/O status	• Input pulse count *1	• Movement pulse count *1
• Word input/output status*2		

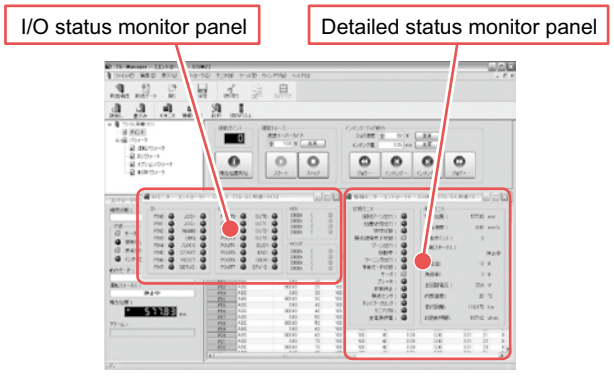
*1: Only on TS-SD *2: Only on TS controllers


Specify a zone for calculation.
Calculates the maximum value, minimum value, average value, and root mean square value in a specified zone.
Traces data at real-time.

3 Various monitor functions and detailed error logs

The robot operation status (operation mode or servo status) and I/O status can be monitored.

Additionally, the Alarm Log screen also displays the input/output I/O status in addition to the carrier position, speed, operation status, current value, and voltage value in case of an alarm. This greatly contributes to the status analysis.

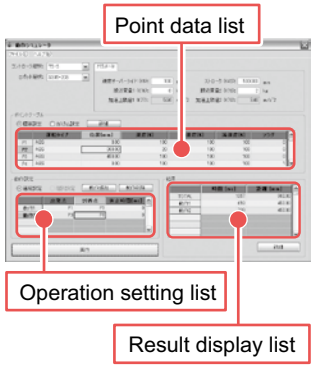


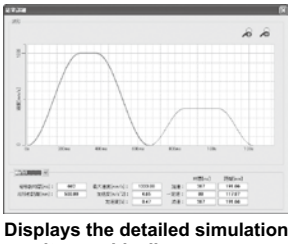
4 Operation simulation

As the operation condition data or point data is input, a period of time necessary for operation is simulated.

Use of this function makes it possible to select an optimal model before purchase and simulate the speed and acceleration/deceleration settings without use of actual machine.

It is also possible to link this operation simulation function with the TS-Manager main software. This easily affects the point data you have edited in the actual machine.





Displays the detailed simulation results graphically.

Single axis

RDX/RDP

Robot driver | Only for pulse train control

As the size is small and weight is light,
it is easy to include in the automated unit.

RDX RDP

Main functions ▶ P.35

Features

1 Dedicated pulse train control

Driver functions by dedicated pulse train control which yields a compact body and a low price!

2 Cost reduction to a large extent is possible in designing the system

Driver easily assembles into automated equipment so a drastic amount of effort needed for tasks such as design, part selection and settings can be eliminated and a huge cost reduction achieved!

3 Compact

Compact design of H160 × W57 × D130mm.

4 Command input: Line driver signal (2Mpps)

5 Command output: ABZ phase output (with divider function)

6 Analog monitor output function

Monitor can show analog outputs such as for speed or electrical current giving the operator a real-time look at operating status.
Dedicated support software TOP can be used to show fully graphic displays.

Model Overview

Name	RDX	RDP
Power	● Main power supply 3-phase 200 to 230V +10% to -15% (50/60Hz +/-5%) ● Control power supply Single phase 200 to 230V +10% to -15% (50/60Hz +/-5%)	
Operating method	Pulse train control	
Maximum number of controllable axes	Single-axis	
Position detection method	Incremental	
Controllable robot	Single-axis robot FLIP-X Note1	Linear motor single-axis robot PHASER
Support software for PC	TOP	

Note 1. Exclude T4 / T5 / C4 / C5 / YMS

Ordering method

● RDX

RDX – [ ] – [ ]

Controller	Driver Note	Regenerative unit Note
	05: 100W or less	RBR1
	10: 200W or less	RBR2
	20: 400W or less	

Note. Driver selection and regenerative unit selection depends on the robot type.
See the selection table on the next page for selecting the driver/regenerative circuit.

● RDP

RDP – [ ] – [ ]

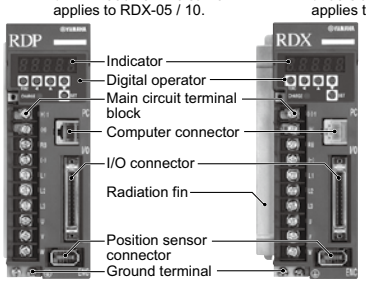
Controller	Driver Note	Regenerative unit Note
	05: 100W or less	No entry: None
	10: 200W or less	RBR1
	20: 400W or less	RBR2
	25: 750W or less	

Note. Driver selection and regenerative unit selection depends on the robot type.
See the selection table on the next page for selecting the driver/regenerative circuit.

Part names

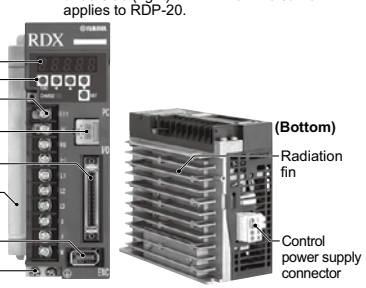
RDX-05 / 10
RDP-05 / 10

Note : The photo shows the front of RDP-05 / 10. The same applies to RDX-05 / 10.



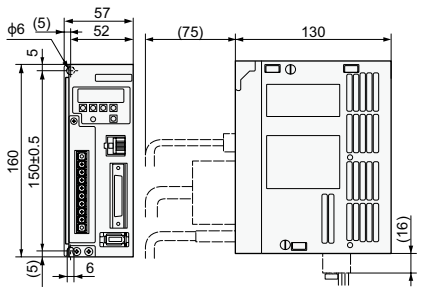
RDX-20
RDP-20

Note : The photos show the front (left) and the underside (right) of RDX-20. The same applies to RDP-20.

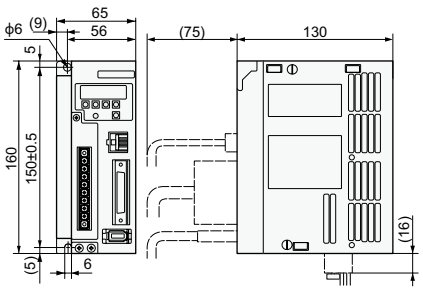


Dimensions

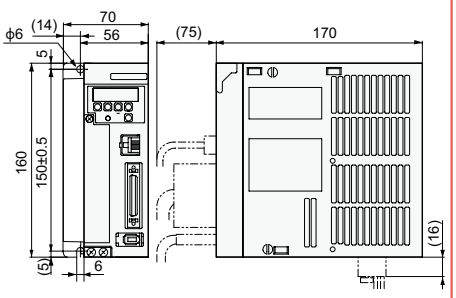
RDX-05/10
RDP-05/10



RDX-20
RDP-20



RDP-25



Driver / regenerative unit selection table

RDX

			FLIP-X																								
			T4LH/ C4LH	T5LH/ C5LH	T6L/ C6L	T9	T9H	F8 / C8	F8L/ C8L	F8LH/ C8LH	F10/ C10	F14/ C14	F14H/ C14H	F17/ C17	F17L/ C17L	F20/ C20	F20N	N15	N18	N15D	N18D	B10	B14	B14H	R5	R10	R20
Driver selection	RDX	05	●	●	●	●		●	●	●	●	●										●	●		●	●	
		10					●						●											●			●
		20												●	●	●	●	●	●	●	●						
Regenerative unit	No entry (None)		●	●																							
	RBR1				●	●	●	●	●	●	●	●	●	❶	●	❶	●	●	●	●	●	●	●	●	●	●	●
	RBR2													❶		❶											

❶ If placed horizontally the RBR1 is required, if placed vertically then RBR2 is required.

RDP

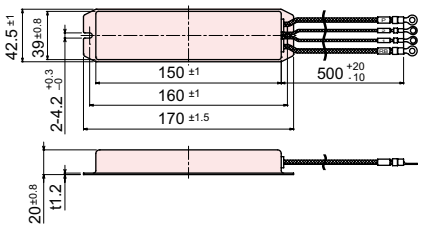
			PHASER					
			MR12/ MR12D	MF7/ MF7D	MF15/ MF15D	MF20/ MF20D	MF30/ MF30D	MF75/ MF75D
Driver selection	RDP	05	●					
		10		●				
		20			●	●	●	
		25						●
Regenerative unit	No entry (None)		●		●	●		
	RBR1			●			●	
	RBR2							●

Regenerative unit RBR1 / RBR2 dimensions

The regenerative unit is a device that converts the braking current generated when the motor decelerates into heat.
Regenerative unit is required for specified Yamaha models and for operation with loads having large inertia.

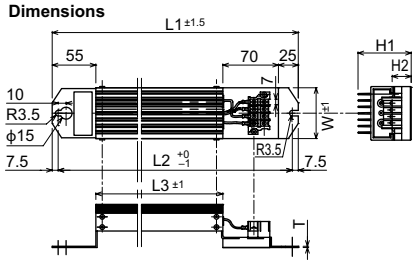
Regenerative unit RBR1

Dimensions



Regenerative unit RBR2

Dimensions



Regenerative unit RBR1 / RBR2 basic specifications

Item	RBR1	RBR2
Model	KBH-M5850-00	KBH-M5850-10
Capacity type	120W	200W
Resistance value	100Ω	100Ω
Permissible braking frequency	2.5%	7.5%
Permissible continuous braking time	12 sec.	30 sec.
Weight	0.27kg	0.97kg

Note. The internal thermal contact point capacity is AC250V, 2A max. ON (b contact point) in the normal state.
Note. The built-in thermal fuse prevents abnormal heat generation which occurs by an erroneous use. (not resettable)
Note. When the thermal relay has worked, reduce the regeneration energy by either stopping the servo amplifier or making the deceleration time longer.
Note. With the regenerative unit, specifications and whether or not required may vary depending on each robot and its operation conditions.

RDX/RDP

Basic specifications

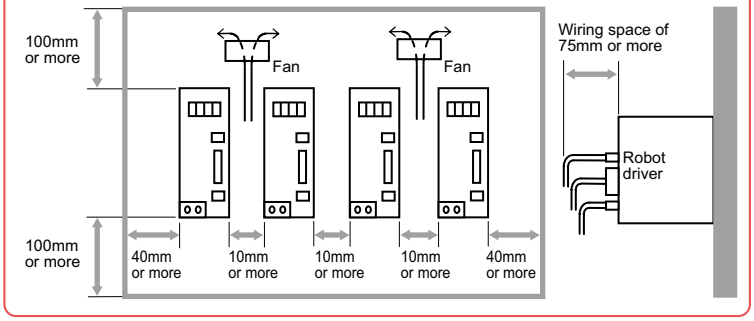
Item		Model	RDX			RDP			
Driver model			RDX-05	RDX-10	RDX-20	RDP-05	RDP-10	RDP-20	RDP-25
Number of controllable axes			Single-axis						
Controllable robots			Single-axis robot FLIP-X			Linear motor single-axis robot PHASER			
Basic specifications	Capacity of the connected motor		200V 100W or less	200V 200W or less	200V 400W or less	200V 100W or less	200V 200W or less	200V 400W or less	200V 750W or less
	Maximum power consumption		0.3kVA	0.5kVA	0.9kVA	0.3kVA	0.5kVA	0.9kVA	1.3kVA
	Dimensions		W57 × H160 × D130mm		W65 × H160 × D130mm	W57 × H160 × D130mm		W65 × H160 × D130mm	W70 × H160 × D170mm
	Weight		0.8kg		1.0kg	0.8kg		1.0kg	1.4kg
	Input power supply	Control power supply	Single phase 200 to 230V+10%, -15%, 50/60Hz +/-5%						
		Motor power supply	3-phase 200 to 230V+10%, -15%, 50/60Hz +/-5%						
Axis control	Position detection method		Resolver			Magnetic linear scale			
	Control system		Sine-wave PWM (pulse width modulation)						
	Control mode		Position control						
	Maximum speed		5000rpm			3.0m/s			
Input/output related function	Position command input		Line driver signal (2M pulses/s or less) (1) Forward pulse + reverse pulse (2) Sign pulse + Command pulse (3) 90-degree phase difference 2-phase pulse command (maximum frequency: 500k pulses/s.) One of (1) to (3) is selectable.						
	Input signal		24V DC contact point signal input (usable for sink/source) (24V DC power supply incorporated) (1) Servo ON (2) Alarm reset (3) Torque limit (4) Forward overtravel (5) Reverse overtravel (6) Origin sensor (7) Return-to-origin (8) Pulse train input enable (9) Deviation counter clear						
	Output signal		Open collector signal output (usable for sink/source) 1) Servo ready 2) Alarm 3) Positioning completed						
	Relay output signal		Braking cancel signal (24V 375mA)			-			
	Position output		Phase A, B signal output: Line driver signal output Phase Z signal output: Line driver signal output / open collector signal output N/8192 (N=1 to 8191), 1/N (N=1 to 64) or 2/N (N=3 to 64)						
	Monitor output		Selectable items: 2ch, 0 to +/-3V voltage output, speed detection value, torque command, etc.						
Internal function	Built-in operator		5-digit number indicator, key input x 5						
	External operator		PC software “TOP” monitoring function, parameter setting function, operation tracing function, trial operation function, etc. RS232C port in use, PC with Windows 95/98/Me, Windows NT/2000/XP can be connected						
	Regenerative braking circuit		Included (but without braking resistor)		Included	Included (but without braking resistor)		Included	
	Dynamic brake		Included (Operation conditions can be set.) (No DB resistor, connection: 2-phase short circuit)						Included (Operation conditions can be set.) (with DB resistor, connection: 2-phase short circuit)
	Protective function		Open type (IPOO)						
	Protective functions		Over-current, overload, braking resistor overload, main circuit overvoltage, memory error, etc.						
Options	Support software for PC		TOP						
General specifications	Operating temperature		0°C to +40°C						
	Storage temperature		-10°C to +70°C						
	Operating humidity		20% to 90%RH (non-condensing)						
	Vibration		5.9m/s^2 (0.6G) 10 to 55Hz						

Note 1. These data are parameters and calculation range in controlling the robot driver and do not indicate the capacity of the robot at the maximum speed.
Note 2. GXL-8FB (made by SUNX) or FL7M-1P5B6-Z (made by YAMATAKE) is used for the origin sensor. The power consumption of the origin sensor is 15mA or less (at open output) and only 1 unit of the origin sensor is connected to each robot driver. (future specification)
Note 3. Use the dynamic brake for emergency stop. Note that the braking may be less effective depending on the robot model.
Note 4. JEM1030 is used as the base for the protection method.
Note 5. Storage temperature applies to the temperature during transportation.
Note 6. The JIS C0040 test method is uses as the base.

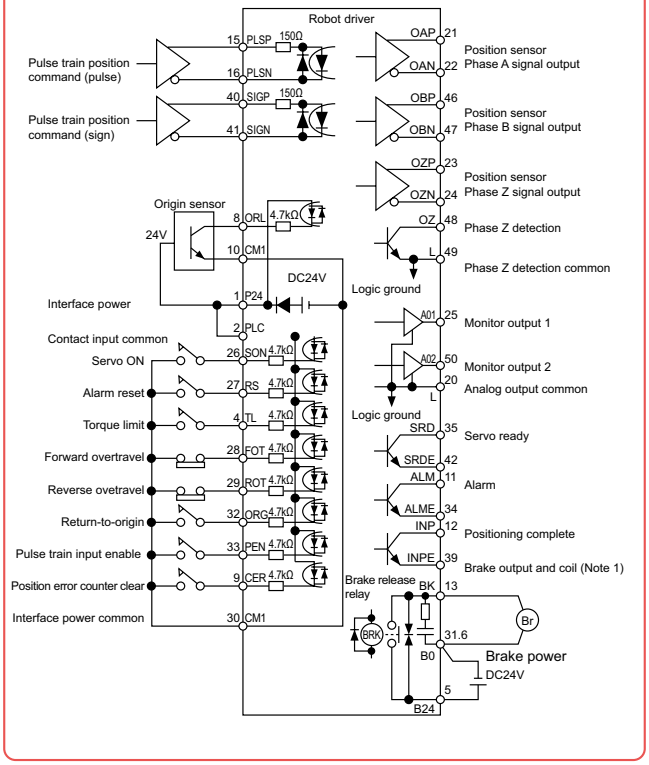
Installation conditions

- Install the RDX/RDP on a vertical metal wall.
- Install the RDX/RDP in a well ventilated location, with space on all sides of the RDX/RDP.
- Ambient temperature : 0 to 40˚C
- Ambient humidity : 20 to 90% RH (no condensation)
- When placing two or more robot drivers in one operating panel, install them as shown in the figure on the right.

RDX/RDP



Input / output signal connection diagram



List of RDP / RDX terminal functions

Type	Terminal symbol	Terminal name	Description
Input signal	P24	Interface power	Supplies 24V DC for contact inputs. Connecting this signal to the PLC terminal allows using the internal power supply. Use this terminal only for contact input. Do not use for controlling external equipment connected to the robot driver, such as brakes
	CM1	Interface power common	This is a ground signal for the power supply connected to P24. If using the internal power supply then input a contact signal between this signal and the contact-point signal.
	PLC	Intelligent input common	Connect this signal to the power supply common contact input. Connect an external supply or internal power supply (P24).
	SON	Servo ON	Setting this signal to ON turns the servo on (supplies power to motor to control it). This signal is also used for estimating magnetic pole position when FA-90 is set to oFF or oFF2.
	RS	Alarm reset	After an alarm has tripped, inputting this signal cancels the alarm. But before inputting this reset signal, first set the SON terminal to OFF and eliminate the cause of the trouble.
	TL	Torque limit	When this signal is ON, the torque limit is enabled.
	FOT	Forward overtravel	When this signal is OFF, the robot will not run in forward direction. (Forward direction limit signal)
	ROT	Reverse overtravel	When this signal is OFF, the robot will not run in reverse direction. (Reverse direction limit signal)
	ORL	Origin sensor	Input an origin limit switch signal showing the origin area.
	ORG	Return-to-origin	Inputting this signal starts return-toorigin operation.
	PEN	Pulse train input enable	When this signal is turned on, the pulse train position command input is enabled.
	CER	Position error counter clear	Inputting this signal clears the position deviation (position error) counter. (Position command value is viewed as current position.)
Analog common	L	Analog common	This is the ground for the analog signal.
Output signal	SRD SRDE	Servo ready	This signal is output when the servo is ready to turn on (with main power supply turned on and no alarms tripped.)
	ALM ALME	Alarm	An alarm signal is output when an alarm has tripped. (This signal is ON in normal state and OFF when an alarm has tripped.)
	INP INPE	Positioning complete	This signal is output when the deviation between the command position and current position is within the preset positioning range.
Relay output	BK (B24) (Note 1)	Brake release relay output	When the servo is ON, this terminal outputs a signal to allow releasing the brake. (FLIP-X series only)
Monitor output	AO1	Monitor output 1	Outputs speed detection values, torque commands, etc. as analog signal voltages for monitoring. Signals to output are selected by setting parameters. These signals are only for monitoring. Do not use for control.
	AO2	Monitor output 2	
	L	Monitor output common	This is the ground for the monitor signal.
Position command	PLSP	Position command pulse (pulse signal)	Select one of the following signal forms as the pulse-train position command input. (1) Command pulse + direction signal (2) Forward direction pulse train + reverse direction pulse train (3) Phase difference 2-phase pulse
	PLSN		
	SIGP	Position command pulse (sign signal)	
	SIGN		
Position sensor monitor	OAP	Position sensor Phase A signal	Outputs monitor signal obtained by dividing “phase A” signal of position sensor.
	OAN		
	OBP	Position sensor Phase B signal	Outputs monitor signal obtained by dividing “phase B” signal of position sensor.
	OBN		
	OZP	Position sensor Phase Z signal	Outputs monitor signal for position sensor “phase Z” signal.
	OZN		
	OZ	Phase Z detection	Outputs monitor signal for position sensor “phase Z” signal.
	L	Phase Z detection common	
Braking power input	B24 (Note 1)	Brake power input	Input 24V DC brake power to this terminal.
	B0 (Note 1)	Brake power common	Common terminal input for brake power.

Note 1. B24, BO and BK are available only with RDX, and not with RDP.

Standard accessories

I/O connector (no brake wiring)

Model	KBH-M4420-00

I/O connector (with brake wiring)

Model	KBH-M4421-00

Control power supply connector

Model	KBH-M4422-00

Support software for PC

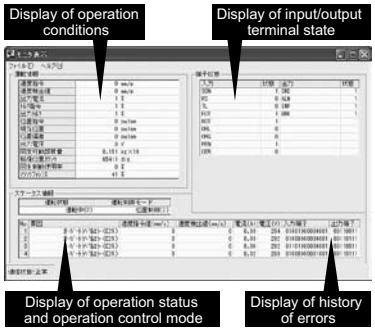
TOP Windows Tool for Optimizing Parameters Software for setup

This software is intended exclusively for RDP/RDX.Using the Windows operating computer, it is possible to set parameters, to monitor the position, speed and torque and to have graphics displayed, assuring pleasant and easy operation in the Windows® 95/98/ME, Windows NT®, Windows® 2000 or Windows® XP environment.

Features

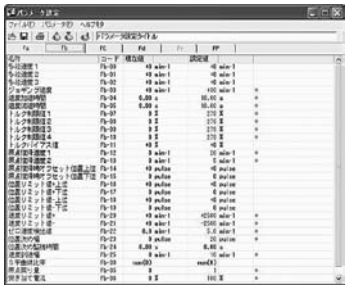
1 Monitoring function

It is possible to monitor the operation condition and output state in real time.


Display of operation conditions
Display of input/output terminal state
Display of operation status and operation control mode
Display of history of errors

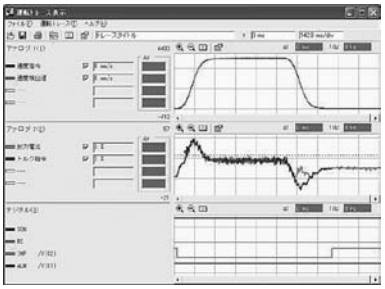
2 Setting parameters

It is possible to set, change, print and store the parameters.



3 Operation tracing function

It is possible to have the servo motor speed and electric current displayed in the form of graphics.



Communication cable for PC supporting software TOP (2m)

Communication cable to connect PC and a controller.

Model	KBH-M538F-00

Support software TOP

TOP is RDX / RDP dedicated software.

Model	KBH-M4966-00

Environment

PC	DOS/V PC
OS	Windows® 95/98/Me Windows NT® Windows® 2000 Windows® XP
Communication method	RS-232C

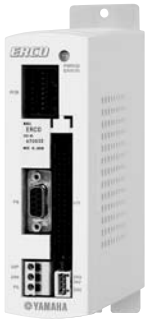
Note. Windows® 95/98/Me, Windows NT®, Windows® 2000 and Windows® XP are trademarks of Microsoft Corporation registered in U.S.A. and other countries.

Single axis

ERCD

Robot controller | Dedicated for T4L / T5L / C4L / C5L / YMS

Low price and compact in size.
In addition to the conventional functions,
a pulse train function is added for a wider application range.



Main functions ▶ P.35

Features

1 Supports 4 operating methods including pulse train, programming, point trace, online instructions

2 Reinforced sequence function

More system layout freedom! Now easier to use than ever before!

3 Torque restriction control

This function limits the maximum torque during robot movement via a program command. It allows operations such as press-fit, push, and gripping, etc.

4 Zone output function

This function controls the signal output (on/off) when the robot position enters within a specified range or zone. It can be set to trigger at area decision made by upstream device.

Model Overview

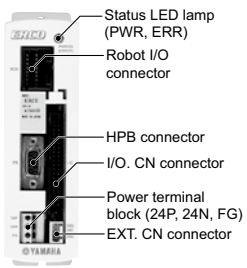
Name	ERCD
Power	DC24V
Operating method	Pulse train control / Programming / I/O point tracing / Remote command / Operation using RS-232C communication
Maximum number of controllable axes	Single-axis
Position detection method	Incremental
Controllable robot	Deicated for T4L / T5L / C4L / C5L / YMS
Programming box	HPB / HPB-D (with enable switch) P.429
Support software for PC	POPCOM P.427

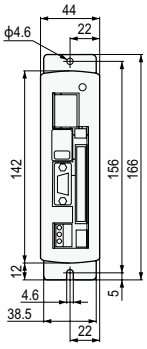
Ordering method

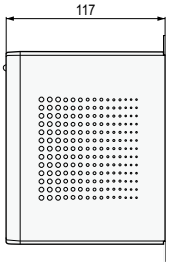
ERCD - [ ]

Controller	I/O connector specification
	CN1: I/O flat cable 1m (Standard)
	CN2: Twisted-pair cable 2m (pilse train function)

Part names / dimensions







Standard accessories

24V power connector (for EXT. CN)

Model	KAU-M4422-00

I/O flat cable (CN1)

Connector and flat cable used to connect the standard parallel I/O of the ERCD / SRCP30 controllers and an external equipment (sequencer). The cable is 1m long with its end cut and left as it is.

Model	KAU-M4421-00

I/O twisted-pair cable (CN2)

Connector and twisted pair cable used to connect parallel I/O of ERCD / SRCP30 controllers and an external equipment. The cable is 2m long with its end cut and left as it is. Select CN2 when using the pulse train input equipment.

Model	KAU-M4421-10

ERCD

Basic specifications

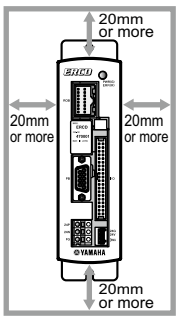
Item				Model	ERCD
Number of controllable axes					Single-axis
Controllable robots					Single-axis robot FLIP-X series T4L / T5L / C4L / C5L / YMS
Basic specifications	Capacity of the connected motor				DC24V 30W or less
	Dimensions				W44 × H166 × D117mm
	Weight				0.45kg
	Input power supply				DC24V +/-10% maximum 3A to 4.5A (Variable depending on robots in use.)
Axis control	Drive method				AC full-digital software servo
	Position detection method				Resolver
	Operating method				Normal mode: point trace movement, program operation, operation using RS-232C communication Pulse Train mode: operation by pulse train input
	Position indication units				mm (millimeters)
	Speed setting				1% to 100% (Setting by 1% unit)
	Acceleration setting				1. Automatic speed setting per robot No. and payload 2. Setting based on acceleration and deceleration parameter 1% to 100% (Setting by 1% unit)
	Resolution				16384 P/rev
	Origin search method				Incremental
Program	Program language				YAMAHA SRC
	Multitasks				4 tasks
	Point-data input method				Manual data input (coordinates input), Direct teaching, Remote teaching
Memory	RAM				32 Kbytes with lithium battery backup (5-year life) Retains programs, point data, parameters and alarm history
	Programs				100 programs (Maximum program number) 255 steps per program 1024 steps / total or less
	Points				1000 points (256 when point tracing)
External input/output	I/O interface	Normal mode Note1	Sequence input		Dedicated input 8 points, General input 6 points
			Sequence output		Dedicated input 3 points, General input 6 points, Open collector output
		Pulse train mode Note1	Sequence input		Dedicated input 5 points, General input 6 points
			Sequence output		Dedicated input 3 points, General input 6 points, Open collector output
			Command pulse input	Type	1.Phase A / phase B, 2.Pulse / code, 3.CW / CCW
				Mode	Line driver (+5V)
				Frequency	Maximum 2 Mpps
		Feedback pulse output		Terminal name	PA+, PA-, PB+, PB-, PZ+, PZ-
				Type	Phase A / phase B / phase Z
				Mode	Line driver (+5V)
				Number of pulse	16 to 4096 P/rev
		Power supply for sequence I/O			External DC +24V input
	Emergency stop input				Normal close contact point input
	Brake output				Relay output (for 24V/300mA brake) 1CH
	External communications				RS-232C 1CH (For communication with HPB or PC)
Options	Programming box				HPB, HPB-D (with enable switch)
	Support software for PC				POPCOM
General specifications	Operating temperature				0°C to 40°C
	Storage temperature				-10°C to 65°C
	Operating humidity				35% to 85%RH (non-condensing)
	Noise resistance capacity				IEC61000-4-4 Level 2
	Protective functions				Overload, overvoltage, voltage drop, resolver wire breakage, runaway detection, etc.

Note 1. Switching between the normal mode and pulse train mode is done by use of the parameter.

Installation conditions

- Install the ERCD inside the control panel.
- Install the ERCD on a vertical wall.
- Install the ERCD in a well ventilated location, with space on all sides of the ERCD (See fig. at right.).
- Ambient temperature : 0 to 40˚C
- Ambient humidity : 35 to 85% RH (no condensation)

● ERCD



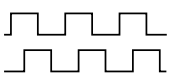
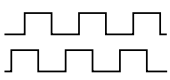
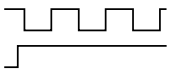
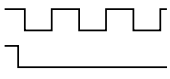
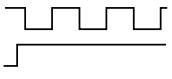
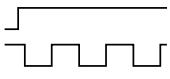
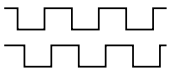
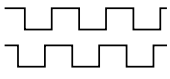
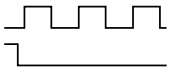
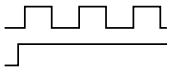
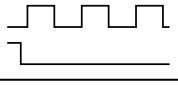
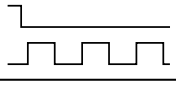
Connector I/O signals

Terminal number	Signal name	Function
A-1	ABS-PT	Move the point from the origin position
B-1	INC-PT	Move the point from the current position
A-2	AUTO-R	Start automatic operation
B-2	STEP-R	Start step operation
A-3	ORG-S	Return to the origin
B-3	RESET	Reset
A-4	SERVO	Return to servo on
B-4	LOCK	Interlock
A-5	DI 0	General input 0
B-5	DI 1	General input 1
A-6	DI 2	General input 2
B-6	DI 3	General input 3
A-7	DI 4	General input 4
B-7	DI 5	General input 5
A-8	(SVCE)	Service mode input
B-8	DO 5	General output 5
A-9	DO 0	General output 0
B-9	DO 1	General output 1
A-10	DO 2	General output 2
B-10	DO 3	General output 3
A-11	DO 4	General output 4
B-11	END	End normal execution
A-12	BUSY	Executing the command
B-12	READY	Ready for operation
A-13	FG	Frame ground
B-13	FG	Frame ground
A-14	GND	Signal ground
B-14	GND	Signal ground
A-15	NC	Reserved (use inhibited)
B-15	NC	Reserved (use inhibited)
A-16	NC	Reserved (use inhibited)
B-16	NC	Reserved (use inhibited)
A-17	PA+	Feedback pulse output
B-17	PA-	Feedback pulse output
A-18	PB+	Feedback pulse output
B-18	PB-	Feedback pulse output
A-19	PZ+	Feedback pulse output
B-19	PZ-	Feedback pulse output
A-20	NC	Reserved (use inhibited)
B-20	NC	Reserved (use inhibited)

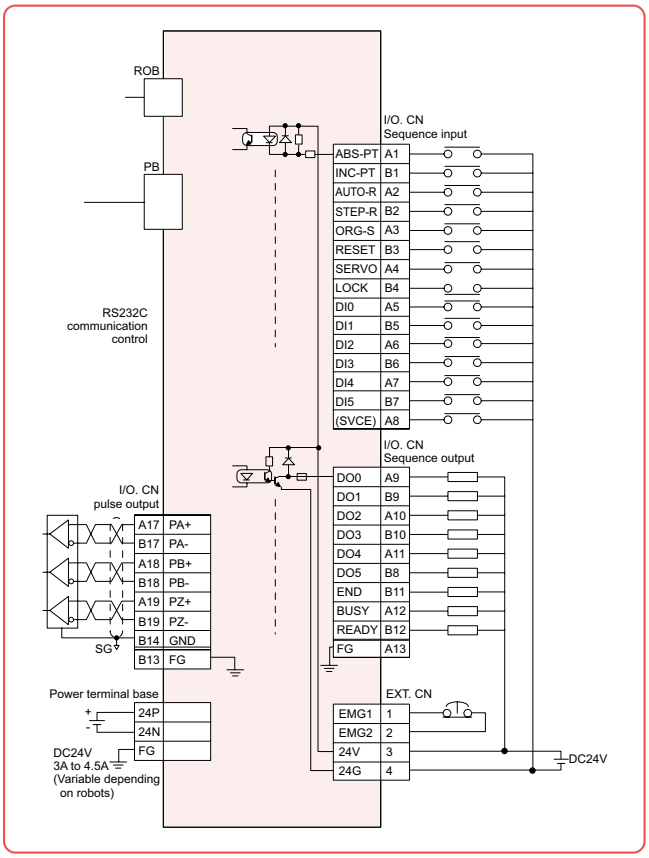
Pulse train I/O connector signals

Terminal number	Signal name	Function
A-1	NC	Reserved (use inhibited)
B-1	NC	Reserved (use inhibited)
A-2	NC	Reserved (use inhibited)
B-2	PCLR	Differential clear input
A-3	ORG-S	Return to the origin input
B-3	RESET	Alarm reset input
A-4	SERVO	Servo-ON input
B-4	INH	Command pulse inhibition input
A-5	DI 0	General input 0
B-5	DI 1	General input 1
A-6	DI 2	General input 2
B-6	DI 3	General input 3
A-7	DI 4	General input 4
B-7	DI 5	General input 5
A-8	NC	Reserved (use inhibited)
B-8	DO 5	General output 5
A-9	DO 0	General output 0
B-9	DO 1	General output 1
A-10	DO 2	General output 2
B-10	DO 3	General output 3
A-11	DO 4	General output 4
B-11	IN-POS	In-position output
A-12	SRDY	Servo ready output
B-12	ALM	Alarm output
A-13	FG	Frame ground
B-13	FG	Frame ground
A-14	GND	Signal ground
B-14	GND	Signal ground
A-15	PULS+	Command pulse input
B-15	PULS-	Command pulse input
A-16	DIR+	Command direction input
B-16	DIR-	Command direction input
A-17	PA+	Feedback pulse output
B-17	PA-	Feedback pulse output
A-18	PB+	Feedback pulse output
B-18	PB-	Feedback pulse output
A-19	PZ+	Feedback pulse output
B-19	PZ-	Feedback pulse output
A-20	NC	Reserved (use inhibited)
B-20	NC	Reserved (use inhibited)

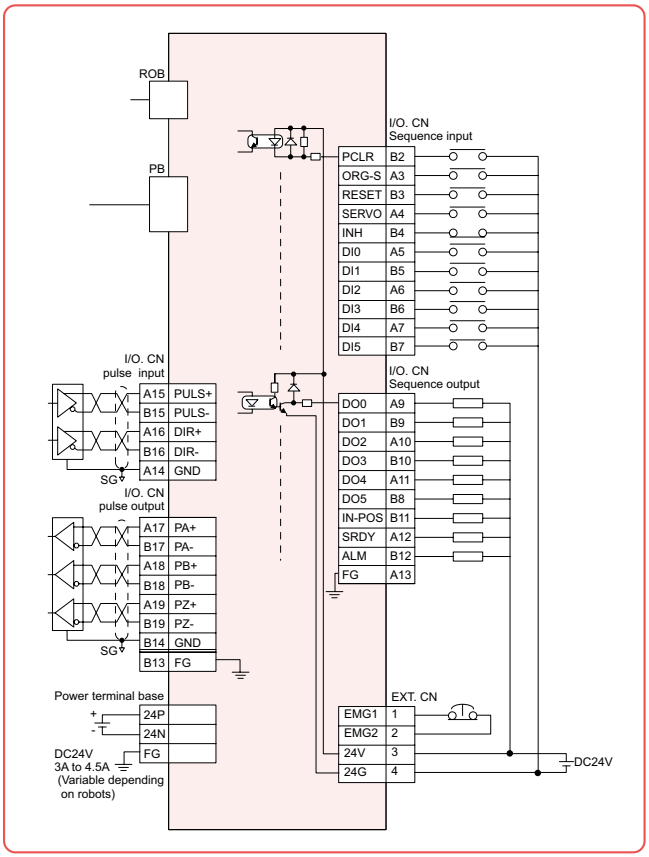
Pulse train input form

Logic	Command pulse form	CW direction	CCW direction
Positive logic	Phase A / phase B		
	Pulse / code		
	CW / CCW		
	Phase A / phase B		
Negative logic	Pulse / code		
	CW / CCW		

Input / output wiring diagram



Pulse train input / output wiring diagram



Robot Language Table

Command	Description
MOVA	Moves to a point data position.
MOVI	Moves from current position by amount of point data.
MOVF	Moves until a specified DI input is received.
JMP	Jumps to a specified label in the specified program.
JMPF	Jumps to a specified label in a specified program according to the input condition.
JMPB	Jumps to a specified label when general-purpose input or memory input is in the specified state.
L	Defines the jump destination for a JMP or JMPF statement, etc.
CALL	Runs another program.
DO	Turns general-purpose output or memory output on or off.
WAIT	Waits until general-purpose input or memory input is in the specified state.
TIMR	Waits the specified amount of time before advancing to the next step.
P	Defines point variable.
P+	Adds 1 to point variable.
P-	Subtracts 1 from point variable.
SRVO	Turns servo on or off.
STOP	Temporarily stops program execution.
ORGN	Performs return-to-origin.
TON	Runs a specified task.
TOFF	Stops a specified task.
JMPP	Jumps to a specified label when the axis position condition meets the specified conditions.
MAT	Defines a matrix.
MSEL	Specifies a matrix to move.
MOVM	Moves to a specified pallet work position on matrix.
JMPC	Jumps to a specified label when the counter array variable C equals the specified value.
JMPD	Jumps to a specified label when the counter variable D equals the specified value.
CSEL	Specifies an array element for counter array variable C.
C	Defines counter array variable C.
C+	Adds a specified value to counter array variable C.
C-	Subtracts a specified value from counter array variable C.
D	Defines counter variable D.
D+	Adds a specified value to counter variable D.
D-	Subtracts a specified value from counter variable D.
SHFT	Shifts the coordinate position by amount of specified point data.
IN	Stores bit information on specified general-purpose input or memory input into counter variable D.
OUT	Outputs the value of counter variable D to specified generalpurpose output or memory output.
LET	Assigns the value of a specified variable to another variable.
TORQ	Defines the maximum torque command value.

Single axis

SR1-X/SR1-P

Robot controller with advanced functions

Compact design with high performance.
Although with one axis,
functions of upper class controllers.

SR1-X SR1-P

Main functions ▶ P.36

Features

1 Support most operating method

Supports diverse operating methods including program operation, point trace, and movement to specified coordinates, etc.

2 Position data hold time: 1 year

The absolute position data hold time which was only 2 weeks, has now been drastically increased to about 1 year.

3 I/O assignment Change

Changing the I/O assignment allows selecting operations such as program operation, point trace, point teaching, and trace operation by specifying coordinates. Jog operation can also be performed from the upstream device.

4 Use of two power supplies

Isolating into main power supply and control power supply yields an even higher degree of safety. It also makes servicing easier when an alarm occurs.

5 Current position output function

These controllers can output the current position as feedback pulse or binary data. This allows the upstream device to know the robot position in real-time.

6 Torque limiting

This function limits the maximum torque value to an optional timing. These controllers offer 2 types of torque limiting: limiting the torque by using parameter data, and limiting torque by using analog input voltages.

7 Various monitor functions

Offers monitor functions of different types including input/output status monitoring, duty monitoring, and analog monitoring, etc.

8 Support safety circuit category 4

Installing an external safety circuit will satisfy safety category class 4 standards. See P.484 for more information.

Model Overview

Name	SR1-X	SR1-P
Power	05 / 10 driver Single phase 100 to 115V/200 to 230V +/-10% maximum (50/60Hz)	20 driver Single phase 200 to 230V +/-10% maximum (50/60Hz)
Operating method	Programming / I/O point tracing / Remote command / Operation using RS-232C communication	
Maximum number of controllable axes	Single-axis	
Position detection method	Absolute / Incremental	Incremental / Semi-absolute
Controllable robot	Single-axis robot FLIP-X	Linear motor single-axis robot PHASER
Programming box	HPB / HPB-D (with enable switch) P.429	
Support software for PC	POPCOM P.427	

Ordering method

SR1-X

SR1-X –	Controller	Driver	Usable for CE	Regenerative unit Note1	Input/Output Selection	Battery
		05: 100W or less 10: 200W 20: 400 to 600W	No entry: Standard E: CE marking	No entry: None R: RG1	N: NPN P: PNP CC: CC-Link DN: DeviceNet PB: Profibus YC: YC-Link Note2	No entry: None (Incremental specification) B: Battery (Absolute specification)

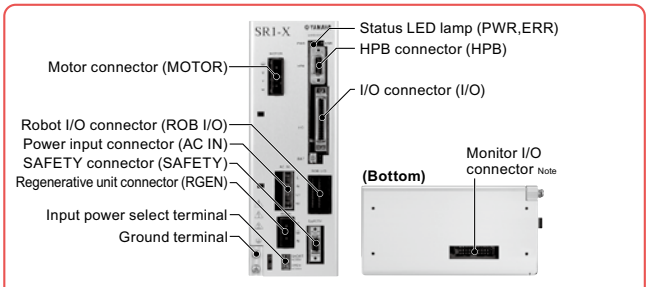
Note 1. Driver selection and regenerative unit selection depends on the robot type. See the selection table on the next page for selecting the driver/regenerative circuit.
Note 2. Available only for the slave.

SR1-P

SR1-P –	Controller	Driver	Usable for CE	Regenerative unit Note1	Input/Output Selection
		05: 100W or less 10: 200W 20: 400 to 600W	No entry: Standard E: CE marking	No entry: None R: RG1	N: NPN P: PNP CC: CC-Link DN: DeviceNet PB: Profibus YC: YC-Link Note2

Note 1. Driver selection and regenerative unit selection depends on the robot type. See the selection table on the next page for selecting the driver/regenerative circuit.
Note 2. Available only for the slave.

SR1-X / SR1-P part names



Note. Cable for monitor I/O (option) is required when using this connector.

SR1-X/SR1-P

Driver / regenerative unit selection table

SR1-X

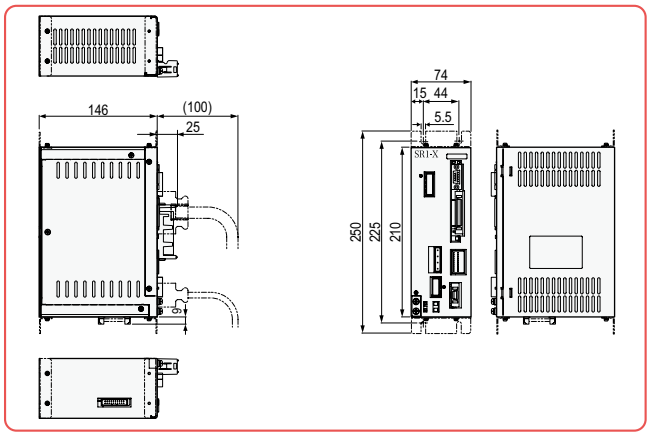
			FLIP-X																						
			T4LH/ C4LH	T5LH/ C5LH	T6L/ C6L	T9	T9H	F8/C8	F8L/ C8L	F8LH/ C8LH	F10 C10	F14/ C14	F14H/ C14H	F17/ C17	F17L/ C17L	F20/ C20	F20N	N15/ N15D	N18/ N18D	B10	B14	B14H	R5	R10	R20
Driver selection	SR1-X	05	●	●	●	●		●	●	●	●	●								●	●	●	●	●	
		10					●						●												●
		20												●	●	●	●	●	●						
Regenerative unit	No entry (None)		●	●	●	(1)	(2)	●	●	●	(1)	(1)	(2)	(3)		(3)	(4)			●	●	(5)	●	●	●
	R (RG1)					(1)	(2)				(1)	(1)	(2)	(3)	●	(3)	(4)	●	●			(5)			

(1) Regenerative unit is needed if using in a perpendicular position and movement stroke is 700mm or more.
(2) Regenerative unit is needed if using in a perpendicular position.
(3) Regenerative unit is needed if using in a perpendicular position, using at maximum speeds exceeding 1000mm per second, or if using high leads (40).
(4) Regenerative unit is needed if using at maximum speeds exceeding 1000mm per second.
(5) Regenerative unit is needed if using at maximum speeds exceeding 1250mm per second.

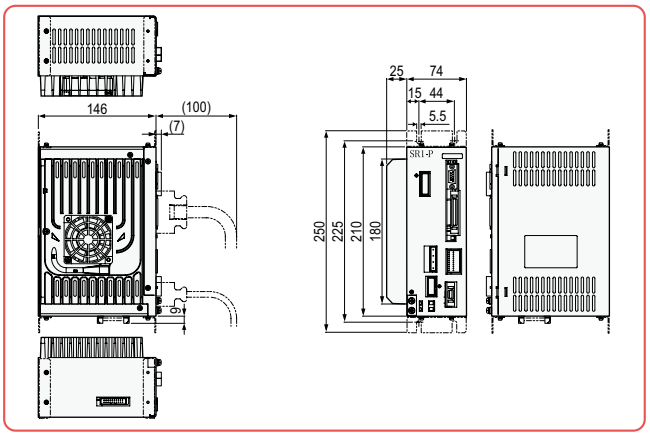
SR1-P

			PHASER									
			MR12/ MR12D	MR16/ MR16D	MR16H/ MR16HD	MR20/ MR20D	MR25/ MR25D	MF7/ MF7D	MF15/ MF15D	MF20/ MF20D	MF30/ MF30D	MF75/ MF75D
Driver selection	SR1-P	05	●	●								
		10			●		●	●	●	●		
		20				●					●	●
Regenerative unit	No entry (None)		●	●	●	●	●	●	●			
	R (RG1)									●	●	
	R (RGU-2)											●

SR1-X / SR1-P 05 · 10 dimensions



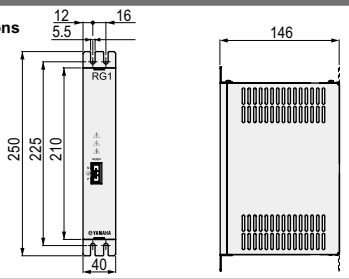
SR1-X / SR1-P 20 dimensions



Regenerative unit RG1 / RGU-2

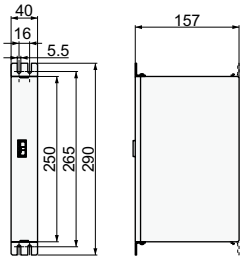
Regenerative unit RG1

Dimensions



Regenerative unit RGU-2

Dimensions



Basic specifications

Item	RG1
Model	KBG-M4107-0A (Including accessory)
Dimensions	W40 × H210 × D146mm
Weight	0.8kg
Regenerative voltage	Approx. 380V or more
Regenerative stop voltage	Approx. 360V or less
Accessory	Cable for connection with controller (300mm)

Note. Always leave an empty space (gap of about 20mm) between this unit and the adjacent controller. Also, always use the dedicated cable when connecting the controller.

Basic specifications

Item	RGU-2
Model	KS5-M4107-0A (Including accessory)
Dimensions	W40 × H250 × D157mm
Weight	0.9kg
Regenerative voltage	Approx. 380V or more
Regenerative stop voltage	Approx. 360V or less
Accessory	Cable for connection with controller (300mm)

Note. Always leave an empty space (gap of about 20mm) between this unit and the adjacent controller. Also, always use the dedicated cable when connecting the controller.

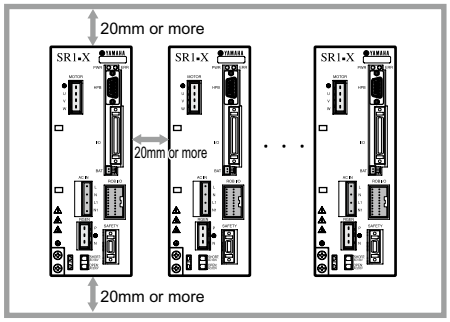
Basic specifications

	Item		Model	SR1-X			SR1-P		
Basic specifications	Driver model			SR1-X-05	SR1-X-10	SR1-X-20	SR1-P-05	SR1-P-10	SR1-P-20
	Applicable motor output			200V 100W or less	200V 200W or less	200V 600W or less	200V 100W or less	200V 200W or less	200V 600W or less
	Number of controllable axes			Single-axis					
	Controllable robots			Single-axis robot FLIP-X (exclude T4L, T5L)			Linear motor single-axis robot PHASER		
	Maximum power consumption			400VA	600VA	1400VA	400VA	600VA	1400VA
	Capacity of the connected motor			100W	200W	600W	100W	200W	600W
	Dimensions			W74 × H210 × D146mm		W99 × H210 × D146mm	W74 × H210 × D146mm		W99 × H210 × D146mm
	Weight			1.54kg		1.92kg	1.54kg		1.92kg
	Input power supply	Control power supply		Single phase AC100 to 115/200V +/-10% maximum 50/60Hz					
		Motor power supply		Single phase AC100 to 115/200 to 230V +/-10% maximum 50/60Hz		Single phase AC200 to 230V +/-10% maximum 50/60Hz	Single phase AC100 to 115/200 to 230V +/-10% maximum 50/60Hz		Single phase AC200 to 230V +/-10% maximum 50/60Hz
Axis control	Drive method			AC full-digital software servo					
	Position detection method			Multi-turn resolver with data backup function			Magnetic linear scale		
	Operating method			Programming, I/O point tracing, Remote command, Operation using RS-232C communication					
	Position indication units			mm (millimeters), deg (degrees)					
	Speed setting			1% to 100% (Setting by 1% unit)					
	Acceleration setting			1. Automatic speed setting per robot No. and payload 2. Setting based on acceleration and deceleration parameter (Setting by 1% unit)					
	Resolution			16384 P/rev			1μm		
	Origin search method			Absolute, Incremental			Incremental, Semi-absolute		
Program	Program language			YAMAHA SRC					
	Multitasks			4 tasks maximum					
	Point-data input method			Manual data input (coordinate value input), Direct teaching, Teaching playback					
Memory	Programs			100 programs 255 steps / 1 programs 3000 steps / total					
	Points			1000 points					
External input/output	STD.DIO	I/O input		Dedicated input 8 points, General input16 points					
		I/O output		Dedicated Output4 points, General output16 points					
	SAFETY			Emergency stop input (Normal close contact point input), service mode input					
	Brake output			Relay contact			–		
	Origin sensor input			Connectable to DC 24V normally-closed contact sensor					
	External communications			RS-232C: 1CH (For communication with HPB / HPB-D or PC)					
	Analog input/output			Input 1ch (0 to +10V) Output 2ch (0 to +10V)					
	Options	Slots		1					
		Type		NPN/PNP: Dedicated input 8 points, Dedicated Output 4 points, General input 16 points, General output 16 points					
				CC-Link: Dedicated input 16 points, Dedicated Output 16 points, General input 32 points, General output 32 points					
				DeviceNet: Dedicated input 16 points, Dedicated Output 16 points, General input 32 points, General output 32 points					
				PROFIBUS: Dedicated input 16 points, Dedicated Output 16 points, General input 32 points, General output 32 points					
Options	Programming box			HPB, HPB-D (with enable switch)					
	Support software for PC			POPCOM					
General specifications	Operating temperature			0°C to 40°C					
	Storage temperature			-10°C to 65°C					
	Operating humidity			35% to 85%RH (non-condensing)					
	Absolute backup battery			Lithium metallic battery			–		
	Absolute data backup period			1 year (in state with no power applied)			–		
	Noise immunity			IEC61000-4-4 Level 3					

Installation conditions

- Install the SR1-X/SR1-P inside the control panel.
- Install the SR1-X/SR1-P on a vertical wall.
- Install the SR1-X/SR1-P in a well ventilated location, with space on all sides of the SR1-X/SR1-P (See fig. at right.).
- Ambient temperature : 0 to 40˚C
- Ambient humidity : 35 to 85% RH (no condensation)

SR1-X/SR1-P



[NPN, PNP type] Input/Output list

Terminal number	Signal name	Function
1	DI.+COM	Input supply+common
2	SERVO	Return to servo on
3	INC-PT	Relative point transfer
4	ABS-PT	Absolute point transfer
5	STEP-R	Step run
6	DI 0	General input 0
7	DI 1	General input 1
8	DI 2	General input 2
9	DI 3	General input 3
10	DI 4	General input 4
11	DI 5	General input 5
12	DI 6	General input 6
13	DI 7	General input 7
14	DO.+COM	Output supply+common
15	DO.+COM	Output supply+common
16	END	Execution result (Execution complete)
17	BUSY	Executing the command
18	DO 0	General output 0
19	DO 1	General output 1
20	DO 2	General output 2
21	DO 3	General output 3
22	DO 4	General output 4
23	DO 5	General output 5
24	DO 6	General output 6
25	DO 7	General output 7
26	DI.-COM	Input supply-common
27	AUTO-R	Auto run
28	RESET	Reset
29	ORG-S	Return to the origin
30	ALMRST	Alarm reset
31	DI 8	General input 8
32	DI 9	General input 9
33	DI 10	General input 10
34	DI 11	General input 11
35	DI 12	General input 12
36	DI 13	General input 13
37	DI 14	General input 14
38	DI 15	General input 15
39	DO.-COM	Output supply-common
40	DO.-COM	Output supply-common
41	READY	Available to operate (Ready for operation)
42	UTL	Utility output
43	DO 8	General output 8
44	DO 9	General output 9
45	DO 10	General output 10
46	DO 11	General output 11
47	DO 12	General output 12
48	DO 13	General output 13
49	DO 14	General output 14
50	DO 15	General output 15

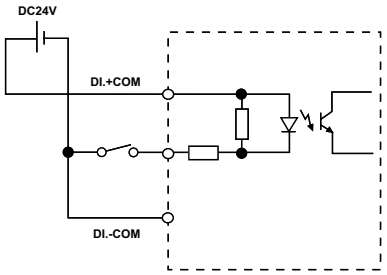
SAFETY connector signals

Terminal number	Signal name	Meaning
1	DI.COM	Input supply common
2	LOCK	Interlock
3	SVCE	SERVICE mode
4	DO.COM	Output supply common
5	MPRDY	Main power ready
6	NC	NC
7	NC	NC
8	NC	NC
9	NC	NC
10	NC	NC
11	EMG1	Emergency stop 1
12	EMG2	Emergency stop 2
13	NC	NC
14	NC	NC

NPN type input/output circuit

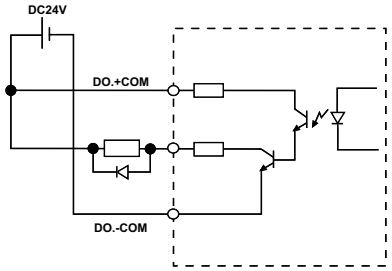
Input circuit

- Form : DC input (positive common type)
  Photo coupler insulation type
- Input power supply : 5mA/point
- Answering time : 30ms or less



Output circuit

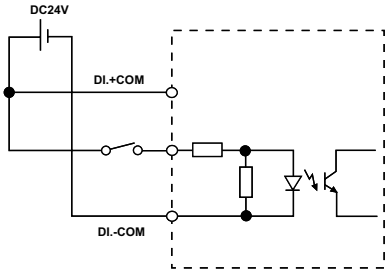
- Form : NPN open collector output (negative common type)
  Photo coupler insulation type
- Load : 50mA/point
- Answering time : 1ms or less



PNP type input/output circuit

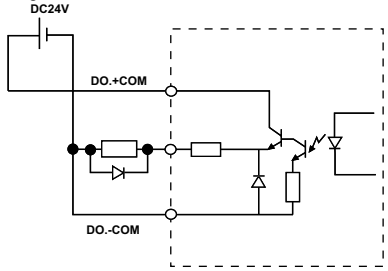
Input circuit

- Form : DC input (negative common type)
  Photo coupler insulation type
- Input power supply : 5mA/point
- Answering time : 30ms or less



Output circuit

- Form : PNP open collector output (positive common type)
  Photo coupler insulation type
- Load : 50mA/point
- Answering time : 1ms or less



Robot Language Table

Command	Description
MOVA	Moves to a point data position.
MOVI	Moves from current position by amount of point data.
MOVF	Moves until a specified DI input is received.
JMP	Jumps to a specified label in the specified program.
JMPF	Jumps to a specified label in a specified program according to the input condition.
JMPB	Jumps to a specified label in a specified program when general-purpose input or memory input is in the specified state.
L	Defines the jump destination for a JMP or JMPF statement.
CALL	Runs another program.
DO	Turns general-purpose output or memory output on or off.
WAIT	Waits until general-purpose input or memory input is in the specified state.
TIMR	Waits the specified amount of time before advancing to the next step.
P	Defines point variable.
P+	Adds 1 to point variable.
P-	Subtracts 1 from point variable.
SRVO	Turns servo on or off.
STOP	Temporarily stops program execution.
ORGN	Performs return-to-origin.
TON	Runs a specified task.
TOFF	Stops a specified task.
JMPP	Jumps to a specified label when the axis position condition meets the specified conditions.
MAT	Defines a matrix.
MSEL	Specifies a matrix to move.
MOVM	Moves to a specified pallet work position on matrix.
JMPC	Jumps to a specified label when the counter array variable C equals the specified value.
JMPD	Jumps to a specified label when the counter variable D equals the specified value.
CSEL	Specifies an array element for counter array variable C.
C	Defines counter array variable C.
C+	Adds a specified value to counter array variable C.
C-	Subtracts a specified value from counter array variable C.
D	Defines counter variable D.
D+	Adds a specified value to counter variable D.
D-	Subtracts a specified value from counter variable D.
SHFT	Shifts the coordinate position by amount of specified point data.
IN	Stores bit information on specified general-purpose input or memory input into counter variable D.
OUT	Outputs the value of counter variable D to specified general-purpose output or memory output.
LET	Shifts the coordinate position by amount of specified point data.

SR1-X/SR1-P

Accessories and part options

Standard accessories

Power connector + wiring connection lever

Model	KAS-M5382-00

Note. Jointly used by RCX221 / 222, RCX240.

Safety connector

Connector plug model	KBG-M4424-00
Connector cover model	KBG-M4425-00

HPB dummy connector

Attach this to the HPB connector during operation with the programming box HPB removed.

Model	KBG-M5163-00

NPN / PNP connector

Connector plug model	KBH-M4424-00
Connector cover model	KBH-M4425-00

Note. Jointly used by RCX221 / 222.

L type stay

Use to install the controller.

Model	KBG-M410H-00

Note. Model No. is for a single bracket (L type stay).

Battery case

This is the absolute battery holder.

Model	KBG-M5395-00

Absolute battery (only for SR1-X)

Battery for absolute data back-up.

Absolute battery basic specifications

Item	Absolute battery
Model	KAS-M53G0-11
Battery type	Lithium metallic battery
Battery capacity	3.6V/2,750mAh
Data holding time	About 1 year (in state with no power applied)
Dimensions	ϕ17 × L53mm
Weight Note1	22g

Note1. Weight of battery itself.

Note. Jointly used by RCX222, RCX240.

Note. The absolute battery is subject to wear and requires replacement. If trouble occurs with the memory then remaining battery life is low so replace the absolute battery. The battery replacement period depends on usage conditions. But generally you should replace the battery after about 1 year counting the total time after connecting to the controller and left without turning on the power.

Options

Cable for monitor I/O

Cable to connect I/O connector of SR1 monitor. The cable is 1.5m long with its end cut and left as it is.

Required when using analog input / output and feedback pulse output.

Model	KBG-M4421-00

PC support software POPCOM

POPCOM is a simple to use application software that makes tasks such as robot operation, writing-editing programs, and point teaching easy to visually understand.

POPCOM software model	KR4-M4966-00

Note. Use POPCOM with Version 1.13.0 or later when using SR1-P / SR1-X.

Data cables

Communication cable for POPCOM.
Select from USB cable or D-sub cable.

USB

D-Sub

Model	USB type (5m)	KBG-M538F-00
	D-Sub type 9pin-9pin (5m)	KAS-M538F-10

Note. This USB cable supports Windows 2000/XP or later.
Note. Data cable jointly used for POPCOM, VIP, VIP+.
Note. USB driver for communication cable can also be downloaded from our website (driver supports VIP+, POPCOM, and TS-Manager).

Programming box HPB / HPB-D

This device can perform all operations such as manual robot operation, program entry and edit, teaching and parameter settings.

HPB HPB-D

	HPB	HPB-D
Model	KBB-M5110-01	KBB-M5110-21
Enable switch	–	3-position
CE marking	Not supported	Applicable

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Environment

OS	Microsoft Windows 3.1/95/98/Me/NT/2000/XP Note. The 64 bit version is not subject to the operation warranty.
CPU	Exceeding the environment recommended by the OS being used
Memory	Exceeding the environment recommended by the OS being used
Hard disk	Vacant capacity of more than 4MB in the installation destination drive
Disk operation	CD-ROM drive
Applicable controllers	ERCD / ERCX / SR1-P / SR1-X / SRCP30 / DRCX

Note. Windows is the registered trademark of US Microsoft Corporation in U.S.A. and other countries.

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Note. Use the converter cable if changing to the SR1-X, SR1-P from a system using SRCX, SRCP. (See P.475).

Support software for PC

POPCOM Windows

PC Offline Programming & Communication

Applicable controllers ▶ ERCD ERCX SR1-X SR1-P DRCX

POPCOM is an easy to operate application software that makes tasks such as robot operation, writing-editing programs, and point teaching easy to visually understand.

Features

1 Easy to use

All items necessary for robot operation are displayed on single screen. There is no need to remember the menu structure so that it can be easily operated with mouse control by anybody.

2 Program editing

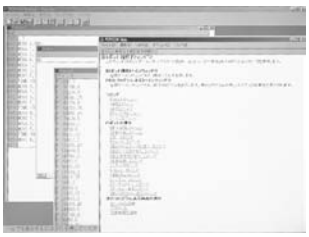
Edit amendment, cut, copy, paste, syntax check and program entry can be performed efficiently with function keys.

3 Point editing

Edit amendment, cut, copy, paste, syntax check, teach and trace functions are provided.

4 Help function

If you need some detailed information, robot language etc. during operation, operate [F1] key or [HELP] key to recall useful information on the screen.



5 Robot operation

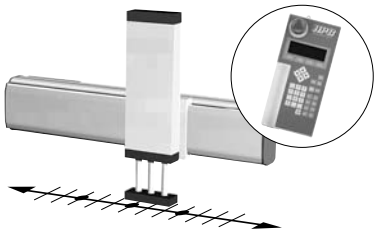
By connecting between a computer and the controller with a communication cable, the controller can control the robot in the same way as a HPB / HPB-D (programming box).

6 Creating point data

There are three methods available for creating the point data.

MDI (Manual Data Input) teaching

The numeric keyboard is used to enter position coordinate data directly.

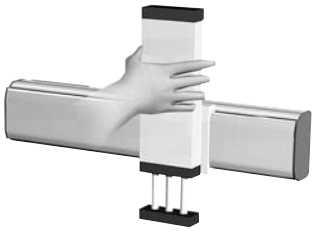


Remote teaching

The robot arm is actually moved to the target position using the keys for point data registration.

Direct teaching

The robot arm is manually moved to the target position with the servo motors off for point data registration.



PC supporting software POPCOM

Model	KR4-M4966-00

Note. Use POPCOM with Version 1.13.0 or later when using SR1-P / SR1-X.

Environment

OS	Microsoft Windows 3.1/95/98/Me/NT/2000/XP Note. The 64 bit version is not subject to the operation warranty.
CPU	Exceeding the environment recommended by the OS being used
Memory	Exceeding the environment recommended by the OS being used
Hard disk	Vacant capacity of more than 4MB in the installation destination drive
Disk operation	CD-ROM drive
Applicable controllers	ERCD / ERCX / SR1-P / SR1-X / DRCX

Note. Windows is the registered trademark of US Microsoft Corporation in U.S.A. and other countries.

Data cables (5m)

Communication cable for POPCOM.
Select from USB cable or D-sub cable.

USB

D-Sub

Model	USB type (5m)	KBG-M538F-00
	D-Sub type 9pin-9pin (5m)	KAS-M538F-10

Note. This USB cable supports Windows 2000/XP or later.
Note. Data cable jointly used for POPCOM, VIP, VIP+.
Note. Older type data cable is made for 9Pin-25Pin specifications.
Note. USB driver for communication cable can also be downloaded from our website.

9Pin-25Pin converter adapter

This is an adapter for converting the female D-sub25Pin to a female D-sub9Pin.
This adapter is needed if using the ERCX and DRCX.

Model	KBB-M657E-01

Note. It is unnecessary when using ERCD or SR1-X, SR1-P.

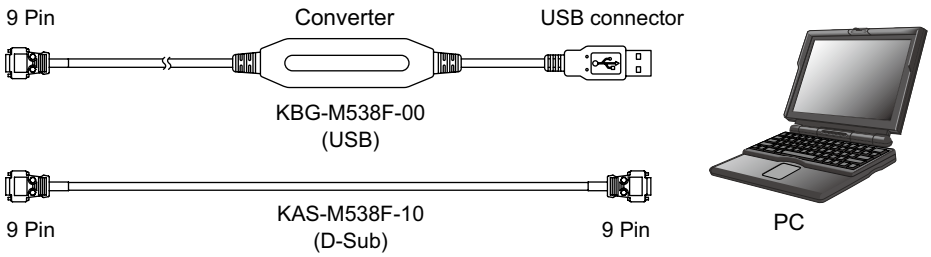
Controller & data cable / converter adapter matchup table

Controller / Data cables	●**ERCD** ●**SR1-X/SR1-P** (9Pin)	●**ERCX** ●**DRCX** (25Pin)
[9Pin-9Pin cable] • KAS-M538F-10 (SSC-2-5L)	Needs no converter adapter	9Pin-25Pin converter adapter KBB-M657E-01

Controller and data cable connection diagrams

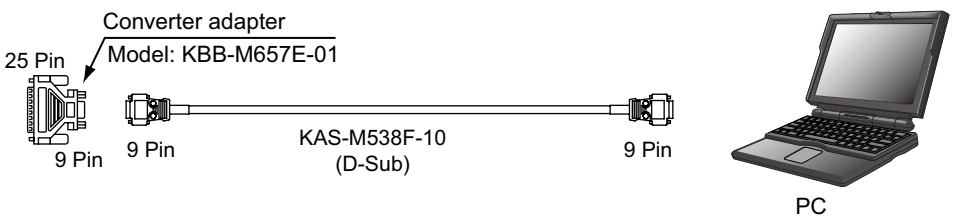
ERCD
SR1-X/P
(9 Pin)

Controller



ERCX
DRCX
(25 Pin)

Controller



Programming box

HPB/HPB-D

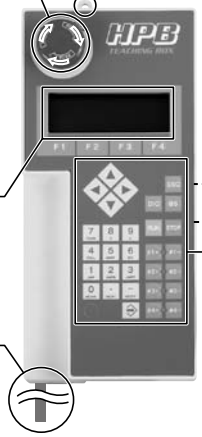
Applicable controllers ▶ ERCD ERCX SR1-X SR1-P DRCX

All operations can be performed from this device including manual robot operation, programming entry and editing, teaching and setting parameters. The display works interactively with the operator so even an absolute beginner can easily learn how to use programming box.

HPB / HPB-D basic specifications

Name		HPB	HPB-D
External view			
Model	Using with ERCD, SR1-X, SR1-P	KBB-M5110-01 (without a conversion adaptor)	KBB-M5110-21 (without a conversion adaptor)
	Using with ERCX, SRCP30, DRCX	KBB-M5110-0A (with a conversion adaptor)	KBB-M5110-2A (with a conversion adaptor)
Display		LCD (20characters × 4 lines)	
Emergency stop button		Normally closed contact point (with lock function)	
Enable switch		–	3-position
CE marking		Not supported	Applicable
Memory back-up device		SD Memory card	
Operating temperature		0°C to 40°C	
Operating humidity		35% to 85%RH (non-condensing)	
Dimensions		W107 × H230 × D53mm (Strap holder, emergency stop button not included.)	
Weight		650g	
Cable length		3.5m	

Part names and function



Emergency stop button

Performs a robot emergency stop when pressed during robot operation. Release the button lock (locks when pressed) by turning the button in the CW direction. After releasing the button, a servo recovery must be performed from the HPB (or by I/O operation) in order to recover from the emergency stop status.

Liquid crystal display

This is a 20-character, 4-line LCD screen. The operation menu and other information are displayed here.

Connector cable

Connects the HPB to the controller. A D-Sub 9-pin connector (male) is provided at one end of the cable.

Strap hole

Attaching a short strap or necklace strap here prevents dropping the HPB while operating it or installing it onto equipment.

SD memory card connector

An SD memory card can be inserted here. SD memory cards are provided by the customer.

Operation keys

These keys are used to operate the robot and to enter programs and data, etc.
The keys are divided into 2 main groups: function keys and data entry/operation keys. (For operation key details, see Chapter 3, “Basic operations”.)

HPB-D rear side

Safety connector (HPB-D only)

Use this connector with the emergency stop or enable switch to configure an external safety circuit. Attaching the supplied 15-pin D-sub connector (female) directly to this safety connector enables the emergency stop button only.

3-position enable switch (HPB-D only)

This switch is effective for use with an external safety circuit.
This switch opens (cuts off) the circuit when pressed or released.
Pressing it to mid-position connects the circuit. Use this switch as the enable switch in Service mode, so that the external safety circuit triggers emergency stop on the robot when this switch is pressed or released.

A conversion adapter for HPB

The adapter converts from 25 pins to 9 pins. If the HPB was ordered along with a converter adapter then this adapter comes packed along with the unit.

Model	KBB-M657E-01

Note. It is unnecessary when using ERCD or SR1-X, SR1-P, SRCP30.

Field network system with minimal wiring

NETWORK

Applicable controllers ▶ ERCX SR1-X SR1-P DRCX

CC-Link

- Option unit with networking functions that can be incorporated in YAMAHA robot controllers, ERCX / SR1-P / SR1-X / DRCX.
- As connection of the robot system and the sequencer requires only one (4-wire) dedicated cable, it is possible to save wiring of the entire system, which contributes to efficient wiring work, reduction of installation and maintenance costs, etc.
- Available I/Os are 32 general inputs / outputs and 16 dedicated inputs / outputs (2 nodes occupied).
- It is possible to perform position specification movement and data reading / writing directly by using the remote commands.

Basic specifications for network modules CC-Link

Item	Network modules CC-Link
Applicable controllers	ERCX / SR1-P / SR1-X / SRCP30 / DRCX
Version supporting CC-Link	Ver. 1.10
Remote node type	Remote device node
Number of occupied nodes	Two nodes fixed
Node number setting	1 to 63
Communication speed setting	10Mbps, 5Mbps, 2.5Mbps, 625Kbps, 156Kbps
No. of CC-Link I/O Note1	General input 32 points, General output 32 points, Dedicated input 16 points, Dedicated Output 16 points
Parallel external I/O (ERCX, SRCP30, DRCX only)	All points usable as parallel external I/O for controller. Each point controllable from master station sequencer (PLC) by emulated serialization, regardless of robot program.
Shortest distance between nodes Note2	0.2m or more
Overall length Note2	100m/10Mbps, 160m/5Mbps, 400m/2.5Mbps, 900m/625Kbps, 1200m/156Kbps
Monitor LED	RUN, ERR, SD, RD

Note 1. Controller I/Os are updated every 10ms.
Note 2. These values apply when a cable that supports CC-Link Ver 1.10 is used.

DeviceNet

- Option unit with networking functions that can be incorporated in YAMAHA robot controllers, ERCX / SR1-P / SR1-X / DRCX.
- As connection of the robot system and the sequencer requires only one (5-wire) dedicated cable, it is possible to reduce wiring of the entire system, which contributes to efficient wiring work, reduction of installation and maintenance costs, etc.
- Available I/Os are 16 general inputs / outputs and 16 dedicated inputs / outputs.
- It is possible to perform position specification movement and data reading / writing directly by using the remote commands.(SR1-X only)

Basic specifications for network modules DeviceNet

Item		Network modules DeviceNet
Applicable controllers		ERCX / SR1-P / SR1-X / SRCP30 / DRCX
Applicable DeviceNet specifications		Volume 1 Release2.0/Volume 2 Release2.0
Device type		Generic Device (device number 0)
Number of occupied CH		Input 2ch Note1, Output 2ch Note1
MAC ID setting		0 to 63
Communication speed setting		500Kbps, 250Kbps, 125Kbps
DeviceNet I/O Note2		General input 16 points Note3, General output 16 points Note3, Dedicated input 16 points, Dedicated Output 16 points
Parallel external I/O (ERCX, SRCP30, DRCX only)		All points usable as parallel external I/O for controller. Each point controllable from master station sequencer (PLC) by emulated serialization, regardless of robot program.
Network length	Overall length Note4	100m/500Kbps, 250m/250Kbps, 500m/125Kbps
	Branch length/Overall branch length	6m or less/39m or less, 6m or less/78m or less, 6m or less/156m or less
Monitor LED		Module, Network

Note 1. Inputs / Outputs are 12ch each when using SR1-P / SR1-X with extension model.
Note 2. Controller I/Os are updated every 10ms.
Note 3. General Inputs / Outputs are 32 each when using SR1-P / SR1-X with extension model.
Note 4. These values apply when a thick cable is used. The distance is less when a fine cable is used or when thick and fine cables are mixed in use.

Profibus

- Option unit used to connect a YAMAHA robot controllers ERCX / SR1-P / SR1-X / DRCX to Profibus.
- Optimum for high speed data communication and complicated communication processing.
- Communication is made available among devices of multiple number of manufacturers.
- It is possible to perform position specification movement and data reading / writing directly by using the remote commands.

Basic specifications for network modules Profibus

Item	Network modules Profibus
Applicable controllers	ERCX / SR1-P / S R1-X / SRCP30 / DRCX
Communication profile	Profibus-DP slave
Number of occupied nodes	1 node
Setting of station address	0 to 126
Communication speed setting	9.6Kbps, 19.2Kbps, 93.75Kbps, 187.5Kbps, 500Kbps, 1.5Mbps, 3Mbps, 6Mbps, 12Mbps (automatic recognition)
Profibus I/O Note	General input 32 points, General output 32 points, Dedicated input 16 points, Dedicated Output 16 points
Parallel external I/O (ERCX / DRCX only)	All points usable as parallel external I/O for controller. Each point controllable from master station sequencer (PLC) by emulated serialization, regardless of robot program.
Overall length	100m/12Mbps, 200m/1.5Mbps, 400m/500Kbps, 1000m/187.5Kbps, 1200m/9.6K · 19.2K · 93.75Kbps

Note. The shortest I/O update interval of the controller is 10ms but the actual I/O update time varies depending on the update time with the master station.

Ethernet

- Option unit used to connect a YAMAHA robot controller to Ethernet, which can be incorporated in YAMAHA robot controllers, ERCX / DRCX. Connection of this unit to the network operation by the TCP/IP protocol with a 10BASE-T cable makes data exchange with a robots easy.
- Capable of making an easy access from the TELNET terminal to the robot controller. As the command system is the same as that by the RS-232C communication, even first-time users can use it easily. (Windows PCs have a built-in TELNET terminal called TELNET.EXE as a standard equipment.)
- With a number of controllers connected in the network, it is possible to perform integrated information control over robots even at a distance from the work site.

Basic specifications for network modules Ethernet

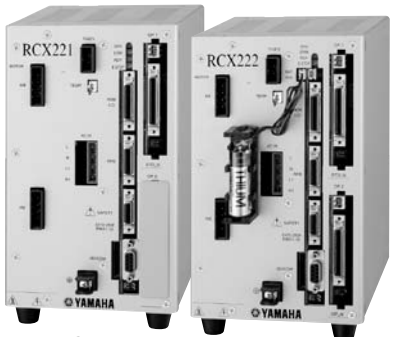
Item	Network modules Ethernet
Applicable controllers	ERCX / SRCP30 / DRCX
Network specification	As specified for Ethernet (IEEE802.3)
Connector specification	RJ-45 connector (8-pole modular connector) 1 port
Baud rate	10Mbps (10BASE-T)
Communication mode	Half Duplex (Half-duplex)
Network protocol	Application layer: TELNET / Transport layer: TCP / Network layer: IP, ICMP, ARP / Data link layer: CSMA/CD / Physical layer: 10BASE-T
Number of simultaneous log inputs	1
Setting of IP address, etc.	Set from HPB / HPB-D
Monitor LED	Run, Collision, Link, Transmit, Receive

1 to 2 axis

RCX221/RCX222

Robot controller with advanced functions

A 2-axis robot controller with a full range of advanced functions in a compact, space-saving size!
Very easy to use.



RCX221 RCX222

Main functions ▶ P.37

Features

1 Compact

Lightweight and compact design with main unit weight of 2.8kg and height of 210mm.

2 Same price as predecessor “DRCX”

Delivers high-performance along with sophisticated functions yet is the same price as the prior DRCX.

3 The absolute position data hold time: 1 year

The current position information is monitored even during a long vacation, while the controller is kept unused and while it is transported so that the return to the origin process is not required when the controller is activated again. (RCX222 / RCX222HP)

4 Simultaneous control of PHASER and FLIP-X

Offers mixed control of linear motor single-axis robot PHASER series, along with 200 VAC motor single-axis robot FLIP-X series. (RCX221/RCX221HP)

5 Anti-collision control function

Internal function in controller acts to prevent carriage collisions when using double carriages.

6 Applicable to various peripheral equipments

Freely select I/O boards as needed.
Supports parallel I/O (NPN/PNP), CC-Link, DeviceNet, Profibus, and Ethernet.

7 Capable of using additional function of “YC-Link” for additional axis

Linking the RCX series controller with the SR1 series single-axis controller allows controlling a maximum of 8 axes (synchronous control of 6 axes).

Model Overview

Name	RCX221 / RCX221HP	RCX222 / RCX222HP
Power	Single phase: AC200V to 230V +/-10% maximum (50/60Hz)	
Operating method	Programming / Remote command / Operation using RS-232C communication	
Maximum number of controllable axes	2 axes maximum	
Position detection method	Incremental / Semi-absolute	Absolute / Incremental
Controllable robot	Cartesian robot XY-X / Single-axis robot FLIP-X / Linear motor single-axis robot PHASER/ Pick & place robot YP-X	Cartesian robot XY-X / Single-axis robot FLIP-X / Pick & place robot YP-X
Programming box	RPB / RPB-E (with enable switch) P.448	
Support software for PC	VIP+ P.446 / VIP	

Ordering method

RCX221 / RCX221HP

RCX221 - [ ] - [ ] - [ ] - [ ]

Controller Note1	Usable for CE	Regenerative unit Note2	Input/Output Selection 1	Input/Output Selection 2
RCX221	No entry: Standard	No entry: None	N: NPN Note3	No entry: None
RCX221HP	E: CE marking	R: RG2	P: PNP	N1: OP.DIO24/16 (NPN) Note3
			CC: CC-Link	P1: OP.DIO24/17 (PNP)
			DN: DeviceNet	EN: Ethernet Note3 Note5
			PB: Profibus	
			EN: Ethernet Note3	
			YC: YC-Link Note4	

Note 1. Driver selection and regenerative unit selection depends on the robot type. See Specification selection table on following page.
Note 2. The regenerative unit (option) is required when operating a model designated by YAMAHA or a load with a large inertia.
Note 3. NPN and Ethernet are not selectable if using CE marking.
Note 4. Available only for the master.
Note 5. Only when you have selected CC, DN or PB for Input/Output selection 1, you can select EN for Input/Output selection 2.

RCX222 / RCX222HP

RCX222 - [ ] - [ ] - [ ] - [ ]

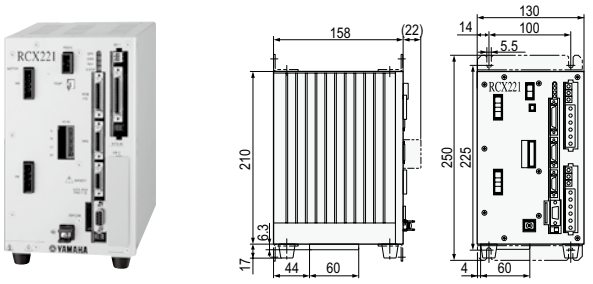
Controller Note1	Usable for CE	Regenerative unit Note2	Input/Output Selection 1	Input/Output Selection 2
RCX222	No entry: Standard	No entry: None	N: NPN Note3	No entry: None
RCX222HP	E: CE marking	R: RG2	P: PNP	N1: OP.DIO24/16 (NPN) Note3
			CC: CC-Link	P1: OP.DIO24/17 (PNP)
			DN: DeviceNet	EN: Ethernet Note3 Note5
			PB: Profibus	
			EN: Ethernet Note3	
			YC: YC-Link Note4	

Note 1. Driver selection and regenerative unit selection depends on the robot type. See Specification selection table on following page.
Note 2. The regenerative unit (option) is required when operating a model designated by YAMAHA or a load with a large inertia.
Note 3. NPN and Ethernet are not selectable if using CE marking.
Note 4. Available only for the master.
Note 5. Only when you have selected CC, DN or PB for Input/Output selection 1, you can select EN for Input/Output selection 2.

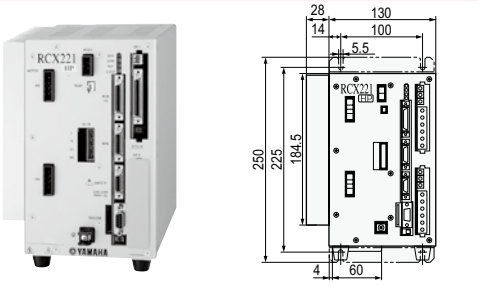
RCX221/RCX222

Part names / dimensions

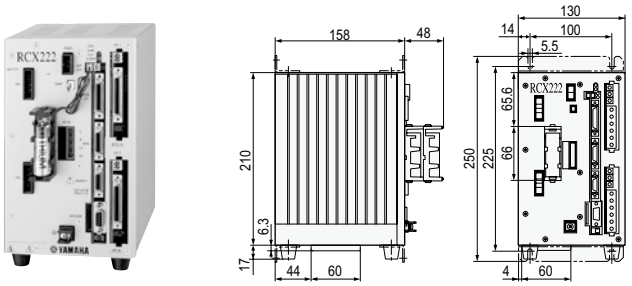
RCX221 Dimensions



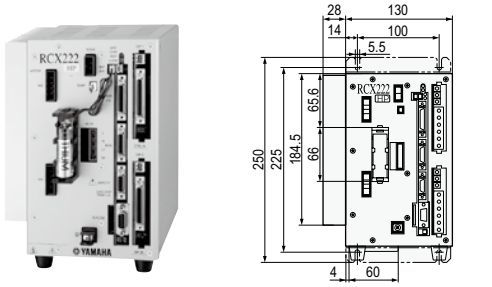
RCX221HP Dimensions



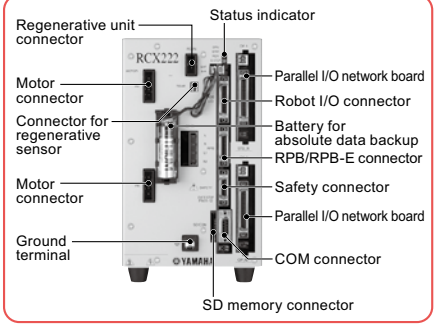
RCX222 Dimensions



RCX222HP Dimensions



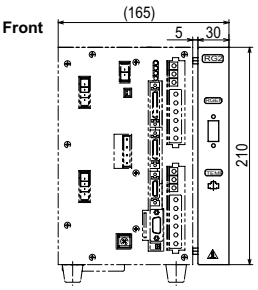
Part names



Note. Photograph shows RCX222. The component names on the RCX221 are the same but it does not come with an absolute backup battery.

Regenerative unit RG2

Regenerative unit RG2



Note. Depth (D) is 158mm.
Installs on the right side of the RCX221 (HP), RCX222 (HP).
Cannot be installed as a separate unit.

Basic specifications

Item	RG2
Model	KAS-M4130-00 (including cable supplied with unit)
Dimensions	W35 × H210 × D158mm
Weight	0.8kg
Regenerative voltage	Approx. 420V or more
Regenerative stop voltage	Approx. 380V or less
Accessory	Cable for connection with controller (300mm)

Note. Installs on the right side of the RCX221 (HP), RCX222 (HP). Cannot be installed as a separate unit.

Specification selection table

The robot type automatically determines the normal specifications or HP specifications.

RCX221 / RCX221HP

		PHASER											
		MR12D	MR16D	MR16HD	MR20D	MR25D	MF7D	MF15D	MF20D	MF30D	MF50D	MF75D
RCX221		●	●	●		●	●	●	●			
RCX221HP					●					●	●	●
Regenerative unit	No entry (None)	●	●	●	●		●	●				
	R (RG2)					●			●	●	●	●

● : Applicable

RCX222 / RCX222HP

		FLIP-X		XY-X													YP-X		Clean
				Arm type, Gantry type, Moving arm type, Pole type							XZ type								
		N15D	N18D	PXYx	FXYx	FXYBx	SXYx	SXYBx	NXY	MXYx	HXYx	HXYLx	SXYx (ZF)	SXYx (ZFL20)	SXYBx (ZF)	SXYBx (ZFL20)	MXYx	HXYx	YP220BX	YP320X	SXYxC
				2 axes																	2 axes
RCX222				●	●	●	●	●	●	●			●	●	●	●	●	●	●	●	●
RCX222HP		●	●								●	●									
Regenerative unit	No entry (None)			●	●	●	●	○					●		●						●
	R (RG2)	●	●					○	●	●	●	●		●		●	●	●			

● : Applicable ○ : Select per conditions

Power capacity

Required power supply capacity varies according to the robot type and number of axes. Prepare a power supply using the following table as a general guide.

When connected to 2 axes (Cartesian robot or multi-axis robot)

Axial current sensor value		Power capacity (VA)
X axis	Y axis	
05	05	500
10	05	700
10	10	900
20	05	1500
20	10	1700
20	20	2000
		2400 (HP)

Note. Even if axial current sensor values for each axis are interchanged no problem will occur.

Motor capacity vs. current sensor table

Connected motor capacity	Current sensor
100W or less	05
200W	10
400W or more	20

Note. Motor output of the B14H is 200W but the current sensor is 05.

Conditions where regenerative unit is needed on multi robots

- Where motor capacity exceeds a total of 450W.
- Where motor capacity for perpendicular axis exceeds a total of 240W.
- Where the following conditions apply when perpendicular axis capacity is 240W or less.
  - perpendicular axis is 200W.
  - perpendicular axis is 100W and stroke is 700mm or more
  - where there are 2 perpendicular axes at 100W, and includes leads of 5mm
- Where maximum speed exceeds 1250mm per second with B14H.

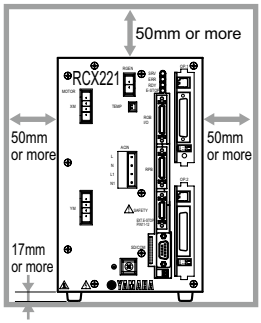
Basic specifications

	Item		Model	RCX221	RCX221HP	RCX222	RCX222HP
Basic specifications	Number of controllable axes			2 axes maximum			
	Controllable robots			Single-axis robot FLIP-X, Linear motor single-axis robot PHASER, Cartesian robot XY-X, Pick & place robot YP-X		Single-axis robot FLIP-X, Cartesian robot XY-X, Pick & place robot YP-X	
	Connected motor capacity			2 axes total: 800W or less	2 axes total: 900W to 1200W	2 axes total: 800W or less	2 axes total: 900W to 1200W
	Maximum power consumption			1700VA	2400VA	1700VA	2400VA
	Dimensions			W130 × H210 × D158mm			
	Weight			Approx. 2.9kg	Approx. 3.1kg	Approx. 2.9kg	Approx. 3.1kg
	Input power supply	Control power supply		Single phase AC200 to 230V +/-10% maximum (50/60Hz)			
		Motor power		Single phase AC200 to 230V +/-10% maximum (50/60Hz)			
Axis control	Drive method			AC full-digital software servo			
	Position detection method			Resolver, Magnetic linear scale		Multi-turn resolver with data backup function	
	Operating method			PTP (Point to Point), Linear interpolation, Circular interpolation, Arch motion			
	Coordinate system			Joint coordinates, Cartesian coordinates			
	Position indication units			Pulses, mm (millimeters), deg (degrees)			
	Speed setting			1% to 100% (In units of 1%. However speed is in units of 0.01% during single-axis operation by DRIVE statement.)			
	Acceleration setting			1.Automatic acceleration setting based on robot model type and end mass parameter 2.Setting based on acceleration and deceleration parameter (Setting by 1% unit)			
	Resolution			1μm		16384 P/rev	
	Origin search method			Incremental / Semi-absolute		Absolute / Incremental	
Program	Program language			YAMAHA BASIC (Conforming to JIS B8439 SLIM Language)			
	Multitasks			8 tasks maximum			
	Sequence program			1 program			
	Point-data input method			Manual data input (coordinate value input), Direct teaching, Teaching playback			
Memory	Memory capacity			364KB (total capacity of program and points) (available program capacity during use of maximum number of points is 84KB)			
	Programs			100 program 9,999: maximum lines per program 98KB: maximum capacity per program			
	Points			10,000 points : maximum numbers of points			
	Memory Backup battery			Lithium metallic battery (service life 4 years at 0℃ to 40℃)			
	Internal flash memory			512KB (ALL data only)			
External input/output	STD.DIO	I/O input		Dedicated input 10 points, General input 16 points			
		I/O output		Dedicated Output12 points, General output 8 points			
	SAFETY			Emergency stop input (Relay contact), Service mode input (NPN/PNP specification is set according to STD. DIO setting)			
	Brake output			Relay contact			
	Origin sensor input			Connectable to DC 24V normally-closed contact sensor			
	External communications			RS232C: 1CH D-SUB9 (female) RS422 : 1CH (RPB)			
	Options	Slots		2 (inc.STD.DIO)			
		Type		STD.DIO (NPN/PNP): Dedicated input 10 points / General input 16 points, Dedicated Output 12 points / General output 8 points			
				Optional input/output (NPN/PNP): General input 24 points / General output 16 points			
				CC-Link: Dedicated input 16 points, Dedicated Output 16 points, General input 96 points, General output 96 points (4 nodes occupied)			
				DeviceNet: Dedicated input 16 points, Dedicated Output 16 points, General input 96 points, General output 96 points			
				Profibus: Dedicated input 16 points, Dedicated Output16 points, General input 96 points, General output 96 points			
				Ethernet: IEEE802.3 10Mbps (10BASE-T)			
Options	Programming box			RPB, RPB-E (with enable switch)			
	Support software for PC			VIP+ / VIP			
General specifications	Operating temperature			0°C to 40°C			
	Storage temperature			-10°C to 65°C			
	Operating humidity			35% to 85%RH (non-condensing)			
	Absolute backup battery			–		Lithium metallic battery 3.6V 5400mAH (2700nAH × 2)	
	Absolute data backup period			–		1 year (in state with no power applied)	
	Noise immunity			IEC61000-4-4 Level3			
	Protecting structure			IP10			

Installation conditions

- Install the RCX221/RCX222 inside the control panel.
- Install the RCX221/RCX222 on a flat, level surface.
- Install the RCX221/RCX222 in a well ventilated location, with space on all sides of the RCX221/RCX222 (See fig. at right.).
- Do not block the heat-sink on the side panel.
- Do not block the fan on the bottom of the controller.
- Ambient temperature : 0 to 40˚C
- Ambient humidity : 35 to 85% RH (no condensation)

● RCX221

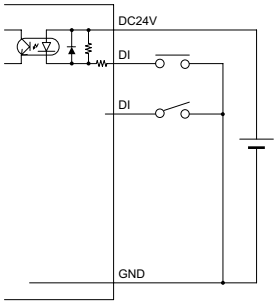


* Provide the same space dimensions for RCX222.

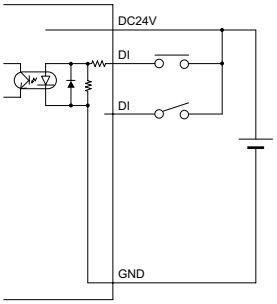
RCX221/RCX222

Example of input signal connection

●NPN specification

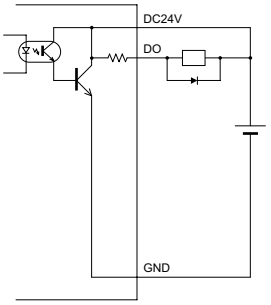


●PNP specification

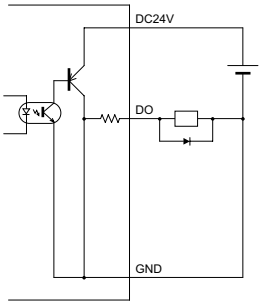


Example of output signal connection

●NPN specification

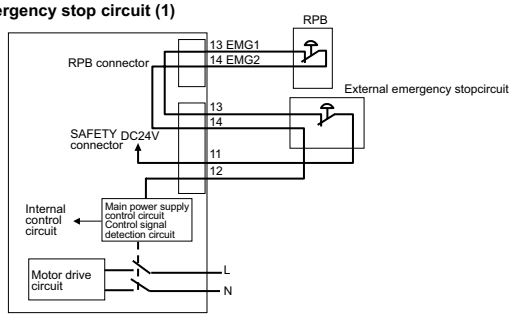


●PNP specification

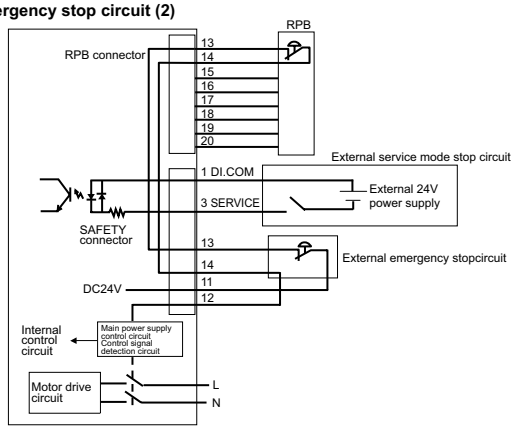


Emergency input signal connections

●Connection when using the standard RPB with an external emergency stop circuit (1)



●Connection when using the standard RPB with an external emergency stop circuit (2)



SAFETY connector signals

Terminal number	I/O No.	Name
1	DI.COM	Dedicated input common
2	INTERLOCK	Interlock signal
3	SERVICE	SERVICE mode input
4	DO.COM	Dedicated output common
5	MPRDY	Main power supply ready
6	SERVO OUT	Servo-on state output
7	NC	No connection
8	KEY1	RPB key switch contact
9	KEY2	RPB key switch contact
10	24VGND	EMG 24V, GND
11	EMG24V	Power supply for emergency stop input
12	EMGRDY	Emergency stop ready signal
13	EMGIN1	Emergency stop input 1
14	EMGIN2	Emergency stop input 2
15	EMGIN3	Emergency stop input 3
16	EMGIN4	Emergency stop input 4
17	LCKIN1	Enable switch input 1
18	LCKIN2	Enable switch input 2
19	LCKIN3	Enable switch input 3
20	LCKIN4	Enable switch input 4

Standard I/O [connector name: STD. DIO] signal table

Terminal number	Signal name	Name	
		RCX221	RCX222
1	DI01	Servo ON	
2	DI10	Sequence program control	
3	DI03	Step run	
4	CHK1	Check input 1	
5	DI05	I/O command run	
6	DI06	Spare Note 1	
7	DI07	Spare Note 1	
8	DI20	General input 20	
9	DI21	General input 21	
10	DI22	General input 22	
11	DI23	General input 23	
12	DI24	General input 24	
13	DI25	General input 25	
14	DI26	General input 26	
15	DI27	General input 27	
16	DO00	EMG monitor (emergency stop monitor)	
17	DO01	CPU OK	
18	DO10	AUTO mode	
19	DO11	Return-to-origin complete	
20	DO12	Sequence program in progress	
21	DO13	Auto operation in progress	
22	DO14	Program reset output	
23	DO15	Battery alarm output Note 2	
24	DO16	END	
25	DO17	BUSY	
26	DI12	Auto operation start	
27	DI13	AUTO mode switching	
28	DI14	ABS reset (Not in use normally)	Return-to-origin Note 3
29	DI15	Program reset	
30	DI16	MANUAL mode	
31	DI17	Return-to-origin (In use normally)	ABS reset Note 4
32	DI30	General input 30	
33	DI31	General input 31	
34	DI32	General input 32	
35	DI33	General input 33	
36	DI34	General input 34	
37	DI35	General input 35	
38	DI36	General input 36	
39	DI37	General input 37	
40	CHK2	Check input 2	
41	DO02	Servo-on state	
42	DO03	Alarm	
43	DO20	General output 20	
44	DO21	General output 21	
45	DO22	General output 22	
46	DO23	General output 23	
47	DO24	General output 24	
48	DO25	General output 25	
49	DO26	General output 26	
50	DO27	General output 27	

Note 1. Use of DI06, DI07 is prohibited.
Note 2. DO15 is a memory backup battery voltage drop alarm output.
Note 3. Set origin return for axes using incremental specifications and axes using semi-absolute specifications.
Note 4. Set origin return on axes using absolute specifications.

Area check output can be assigned to DO20 to DO157.
(Area check output assignment differs depending on the controller software version. See the user's manual for details.)

Option I/O [connector name: OP. DIO] signal table

Terminal number	Signal name	Name
1	–	Spare
2	DI40	General input
3	–	Spare
4	DI41	General input
5	–	Spare
6	–	Spare
7	–	Spare
8	DI50	General input
9	DI51	General input
10	DI52	General input
11	DI53	General input
12	DI54	General input
13	DI55	General input
14	DI56	General input
15	DI57	General input
16	–	Spare
17	–	Spare
18	DO30	General output
19	DO31	General output
20	DO32	General output
21	DO33	General output
22	DO34	General output
23	DO35	General output
24	DO36	General output
25	DO37	General output
26	DI42	General input
27	DI43	General input
28	DI44	General input
29	DI45	General input
30	DI46	General input
31	DI47	General input
32	DI60	General input
33	DI61	General input
34	DI62	General input
35	DI63	General input
36	DI64	General input
37	DI65	General input
38	DI66	General input
39	DI67	General input
40	–	Spare
41	–	Spare
42	–	Spare
43	DO40	General output
44	DO41	General output
45	DO42	General output
46	DO43	General output
47	DO44	General output
48	DO45	General output
49	DO46	General output
50	DO47	General output

RCX221/RCX222

Robot Language Table

General commands

Language	Function
DECLARE	Declares that a label or sub-procedure is in an external program.
DEF FN	Defines a function that is available to the user.
DIM	Declares the name of an array variable and the number of elements.
EXIT FOR	Terminates a FOR statement to NEXT statement loop.
FOR to NEXT	Controls repetitive operations
GOSUB to RETURN	Jumps to a subroutine with the label specified by a GOSUB statement and executes the subroutine.
GOTO	Unconditionally jumps to the line specified by a label.
HALT	Stops a program and resets it.
HOLD	Pauses a program.
IF	Allows control flow to branch according to conditions.
LET	Executes a specified assignment statement.
ON to GOSU	Jumps to a subroutine with each label specified by a GOSUB statement according to conditions and executes the subroutine.
ON to GOTO	Jumps to each line specified by a label according to conditions.
REM	All characters that follow REM or an apostrophe (') are viewed as comments.
SELECT CASE to END SELECT	Allows control flow to branch according to conditions.
SWI	Switches the currently executed program to a specified program, and executes from the first line after compiling.
WHILE to WEND	Controls repetitive operations.
Label statement	Defines "labels" in program lines.

Robot operation

Language	Function
ABSRST	Performs return-to-origin along robot absolute motor axes.
DRIVE	Performs an absolute movement of each axis in the main group.
DRIVEI	Performs a relative movement of each axis in the main group.
MOVE	Performs an absolute movement of the main robot axes.
MOVEI	Performs a relative movement of the main robot axes.
ORIGIN	Performs return-to-origin on an incremental mode axis or absolute search on a semi-absolute mode axis.
PMOVE	Performs a pallet movement of the main robot axes.
SERVO	Controls the servo ON/OFF of the specified axes in the main group or all axes (in main group and sub group).

I/O control

Language	Function
DELAY	Waits for the specified length of time (ms).
DO	Outputs the specified value to the DO ports.
LO	Outputs the specified value to the LO port to prohibit axis movement or permit axis movement.
MO	Outputs the specified value to the MO ports.
OUT	Turns ON the bits of the specified output ports and the command statement ends.
RESET	Turns OFF the bits of the specified output ports.
SET	Turns ON the bits of the specified output ports
SO	Outputs the specified value to the SO port.
TO	Outputs the specified value to the TO port.
WAIT	1. Waits until the condition in DI/DO conditional expression are met. 2. Waits until positioning on the robot axes is complete (within the tolerance range).

Coordinate control

Language	Function
CHANGE	Switches the hand of the main robot.
HAND	Defines the hand of the main robot.
RIGHTY / LEFTY	Selects whether the main robot will be "right-handed" or "left-handed" when moving to a point specified on a Cartesian coordinate system.
SHIFT	Sets the shift coordinates for the main robot by using the shift data specified by a shift variable.

Condition change

Language	Function
ACCEL	Changes the acceleration coefficient parameter of the main group.
ARCH	Changes the arch position parameter of the main group.
ASPEED	Changes the automatic movement speed of the main group.
AXWGHT	Changes the axis tip weight parameter of the main group.
DECEL	Changes the deceleration rate parameter of the main group.
ORGORD	Sets the axis sequence parameter to perform return-to-origin and absolute search in the main group.
OUTPOS	Changes the OUT position parameter of the main group.
PDEF	Defines the pallet used to execute a pallet movement command.
SPEED	Changes the program speed for the main group.
TOLE	Changes the tolerance parameter of the main group.
WEIGHT	Changes the tip weight parameter of the main robot.

Communication control

Language	Function
ONLINE / OFFLINE	Changes communication mode and initialize the communication port.
SEND	Sends the read file data into a write file.

Screen control

Language	Function
PRINT	Displays the value of specified variable on the MPB/RPB screen.

Key control

Language	Function
INPUT	Assigns a value to the variable specified from the MPB/RPB.

Procedure

Language	Function
CALL	Calls up sub-procedures defined by the SUB and END SUB statements.
EXIT SUB	Terminates the sub-procedure defined by the SUB and END SUB statements.
SHARED	Does not permit variables declared with a program written outside a subprocedure (SUB to END SUB) to be passed on as dummy arguments, but allows them to be referred to with a sub-procedure.
SUB to END SUB	Defines a sub-procedure.

Task control

Language	Function
CHGPRI	Changes the priority of the specified task.
CUT	Terminates a task currently being executed or temporarily stopped.
EXIT TASK	Terminates its own task currently being executed.
RESTART	Restarts a task that is temporarily stopped.
START	Sets the task number and priority of the specified task and starts that task.
SUSPEND	Temporarily stops another task being executed.

Error control

Language	Function
ON ERROR GOTO	If an error occurs during program execution, this command allows the program to jump to the error processing routine specified by the label without stopping the program, or stops the program and displays the error message.
RESUME	Resumes the program execution after recovery from an error. This command is used in the error processing routine.
ERL	Gives the line number where an error occurred.
ERR	Gives the error code number when an error occurred.

PATH control

Language	Function
PATH	Sets the PATH motion on the main robot axis.
PATH END	Terminates the path setting for PATH motion.
PATH SET	Starts the path setting for PATH motion.
PATH START	Starts the PATH motion.

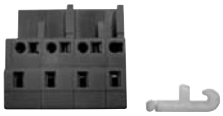
Torque control

Language	Function
DRIVE (with torque limit option)	Executes an absolute movement command on each axis in the main group.
TORQUE	Changes the maximum torque instruction for the specified main group axis.
TRQTIME	Sets the current limit time-out period on the specified main group axis when using a torque limit setting option in the DRIVE statement.
TRQTIME	Sets the current limit time-out period on the specified main group axis when using a torque limit setting option in the DRIVE statement.

Accessories and part options

Standard accessories

Power connector + wiring connection lever



Model	KAS-M5382-00

Note. Jointly used by SR1-P / SR1-X, RCX240.

Safety connector

Model	KAS-M5370-00

RPB terminator (dummy connector)

Attach this to the RPB connector during operation with the programming box RPB removed.

Model	KAS-M5163-00

Note. Jointly used by RCX240.

Standard I/O (STD.DIO) connector

Model	KAS-M533G-00

Option I/O (OP.DIO) connector

Model	KAS-M533G-10

L type stay (for installing front side, rear side.)

Use to install the controller.

Model	KAS-M410H-00

Note. Model No. is for a single bracket (L type stay). (Two are required to install one controller.)

Absolute battery (for RCX222 only)

Battery for absolute data back-up.

Absolute battery basic specifications

Item	Absolute battery
Model	KAS-M53G0-11
Battery type	Lithium metallic battery
Battery capacity	3.6V/2,750mAh
Data holding time	About 1 year Note1 (in state with no power applied)
Dimensions	ϕ17 × L53mm
Weight Note2	22g

Note1. When using 2 batteries. Note2. Weight of battery itself.
Note. Jointly used by SR1-X, RCX240.

Note. The absolute battery is subject to wear and requires replacement. If trouble occurs with the memory then remaining battery life is low so replace the absolute battery. The battery replacement period depends on usage conditions. But generally you should replace the battery after about 1 year counting the total time after connecting to the controller and left without turning on the power.

Battery case

This is the absolute battery holder.

Model	KBG-M5395-00

Absolute battery installation conditions

1 to 2 batteries are required for each 2 axes.

- 1 battery…Data storage time of approximately 6 months (with no power applied)
- 2 batteries…Data storage time of approximately 1 year (with no power applied)

Note. Absolute battery is not required for either of the 2 axes if using incremental or semi-absolute specifications.

Options

Programming box RPB / RPB-E

This device can perform all operations such as manual robot operation, program entry and edit, teaching and parameter settings.

	RPB	RPB-E
Model	KBK-M5110-10	KBK-M5110-00
Enable switch	–	3-position
CE marking	Not supported	Applicable

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Support software for PC VIP+

VIP+ is a simple to use application software that makes tasks such as robot operation, writing-editing programs, and point teaching easy to visually understand.

VIP+ software model	KX0-M4966-00

Data cables

Communication cable for VIP+.
Select from USB cable or D-sub cable.

Model	USB type (5m)	KBG-M538F-00
	D-Sub type 9pin-9pin (5m)	KAS-M538F-10

Note. Data cable jointly used for POPCOM, VIP, VIP+.
Note. USB driver for communication cable can also be downloaded from our website (driver supports VIP+, POPCOM, and TS-Manager).

Environment

OS	Microsoft Windows 2000 / XP / Vista (32bit / 64Bit) / 7 (32bit / 64Bit)
CPU	Processor that meets or exceeds the suggested requirements for the OS being used.
Memory	Suggested amount of memory or more for the OS being used.
Hard disk	40MB of available space required on installation drive.
Communication method	RS-232C, Ethernet Note. For Ethernet communication, Ethernet unit for RCX series controller is required.
Applicable robot controllers	RCX221 / RCX222 / RCX141 / RCX142 / RCX240

Note. Microsoft and Windows are registered trademarks of Microsoft Corporation.
Note. ADOBE and ADOBE READER are registered trademarks of Adobe Systems Incorporated.
Note. Ethernet is a registered trademark of Xerox Corporation.

1 to 4 axis

RCX240/RCX240S

Robot controller with advanced functions

An advanced multi-axial controller newly developed based on long years of actual results! Along with a full range of functions, great engineering also makes it extremely easy to use!

RCX240 RCX240S

Main functions ▶ P.39

Features

1 RCX141 and RCX142 united into one unit

Besides Cartesian and SCARA robots, this controller also handle a mixed combination of single axis robot FLIP-X and linear single-axis robot PHASER.

2 The absolute position data hold time: 1 year

The current position information is monitored even during a long vacation, while the controller is kept unused and while it is transported so that the return to the origin process is not required when the controller is activated again.

3 Linear and circular interpolation in 2 and 3 dimensions

These functions ensure smooth and high precision operation ideal for tasks such as sealing.

4 Passing point output

The general-purpose output can be turned on or off at the specified point during interpolation tasks without having to stop robot operation along that axis.

5 Area check output

During robot operation, this function sends an I/O output when the robot enters a preset area or zone.

6 Push function

This function controls the motor torque during grip and press-fit operation.

7 Dual-synchronous drive function

The RX240 includes a dual-drive function for simultaneously driving 2 axes. The dual drive function is effective on Cartesian robots for conveying heavy-weight payloads and long strokes along the Y axis.

8 Multitasking function

This function simultaneously runs multiple (maximum of 8 tasks) in parallel on robot peripheral equipment, etc.

9 2-robot control & auxiliary axis control

Assigning 2 robot units as main and sub allows multitasking as well as operating these robots asynchronously.

10 Supports a full range of options

Select from parallel I/O boards (NPN/PNP), and network options (CC-Link, DeviceNet, Profibus, Ethernet).
Also supports the iVY board and tracking boards.

11 Capable of using additional function of "YC-Link option" for additional axis

Linking the RCX series controller with the SR1 series single-axis controller allows controlling a maximum of 8 axes (synchronous control of 6 axes).

12 Utilizes system assets from prior models RCX141 / RCX142

This RCX240 is compatible with systems using the RCX141, RCX142 and so can be shifted unchanged to function as host/upstream device on those systems.

Model Overview

Name	RCX240 / RCX240S
Power	Single phase : AC200V to 230V +/-10% maximum (50/60Hz)
Operating method	Programming / Remote command / Operation using RS-232C communication
Maximum number of controllable axes	4 axes maximum
Position detection method	Incremental / Absolute
Controllable robot	Cartesian robot XY-X / SCARA robot YK-XG / Single-axis robot FLIP-X / Linear motor single-axis robot PHASER / Pick & place robot YP-X
Programming box	RPB / RPB-E (with enable switch) P.448
Support software for PC	VIP+ P.446 / VIP

☆ Please note that:

The current sensor on the RCX240S cannot be set to 20A.
As a controller stocked for maintenance, please order an RCX240 that can be set to any of 05A, 10A and 20A.

Ordering method

RCX240
RCX240S

Controller Note1	Usable for CE	Regenerative unit Note2	Option I/O	Network Option	iVY System Option board	Gripper	Battery
RCX240: Standard model	No entry: Standard	No entry: None	N, P: Standard I/O 16/8	No entry: None	No entry: None	No entry: None	No entry: None Note6
RCX240S: Low capacity model	E: CE marking	R: RGU-2	N1, P1: 40/24 points	CC: CC-Link	VY: iVY (Vision)	GR: Gripper	B: 2pcs Note7
		R3: RGU-3 Note3	N2, P2: 64/40 points	DN: DeviceNet	TR: iVY+Light+Tracking		BB: 4pcs Note8
			N3, P3: 88/56 points	PB: Profibus	LC: iVY+Light		
			N4, P4: 112/72 points	EN: Ethernet			
				EP: EtherNet/IP			
				YC: YC-Link Note5			

Note 1. The RCX240S controller is limited to use with robots that handles 200W or lower on each axis. Check the following controller selection table to find the matching model.
Note 2. The regenerative unit (option) is required when operating a model designated by YAMAHA or a load with a large inertia. Please refer to the following regenerative unit selection table.
Note 3. YK550X / YK500XG to YK1000XG are for RGU-3.
Note 4. Use N to N4 when NPN is selected on the I/O board, and P to P4 when PNP is selected.
Note 5. Available only for the master.
Note 6. Uses no-battery specifications if connecting to all axis - linear motor.
Note 7. If any or Single-axis among the XY axes are absolute specifications then 2 batteries are required.
Note 8. If any or Single-axis among the ZR axes are absolute specifications then 2 batteries are required.

Controller model selection table

The RCX240S controller is limited to use with robots that handles 200W or lower on each axis and is partly modified such as for optimizing the IPM, but it is fully compatible with RCX240 operation and functions, and peripheral equipment can be used by both models.

	XY-X									YK-XG																																				CLEAN									
	PXYX	FXYX	FXYBX	SXYX	SXYBX	NXY	MXYX	HXYX	HXYLX	YK500TW	YK120XG	YK150XG	YK180X/XG	YK220X	YK250XG	YK350XG	YK400XG	YK500XGL	YK500XG	YK600XGL	YK600XG	YK700XG	YK800XG	YK900XG	YK1000XG	YK1200X	YK300XGS	YK400XGS	YK500XGS	YK600XGS	YK700XGS	YK800XGS	YK900XGS	YK1000XGS	YK250XGP	YK350XGP	YK400XGP	YK500XGLP	YK500XGP	YK600XGLP	YK600XGP	YK600XGHP	YK700XGP	YK800XGP	YK900XGP	YK1000XGP	YK180XGC	YK220XC	YK250XGC	YK350XGC	YK400XGC	YK500XGLC	YK500XC	YK600XGLC	YK600XC	YK700XC	YK800XC	YK1000XC
RCX240						●	●	●	●	●									●		●	●	●	●	●	●				●	●	●	●	●	●					●		●	●	●	●											●		●	●	●	●
RCX240S	●	●	●	●	●						●	●	●	●	●	●	●	●		●						●	●							●	●	●	●		●								●	●	●	●	●	●		●				

Multi-robot: Driver list for each model

For “multi-robots” that are used in combination with one or more single-axis robots, the RCX240S can be used unless the divers for the combined models include a 20A model.

		FLIP-X																						PHASER					
		T4LH	T5LH	T6L	T9	T9H	F8/F8L/F8LH	F10	F14	F14H	F17/F17L	F20/F20N	N15	N18	B10	B14/B14H	R5	R10	R20	MR12	MF7	MF15	MF20	MF30	MF75
Driver	05A	●	●	●	●		●	●	●						●	●	●	●		●						
	10A					●				●									●		●	●	●				
	20A										●	●	●	●										●	●		

Regenerative unit selection table

| | XY-X | | | | | | YK-XG | | | | | | | | | | | | | | | | | | |

RCX240/RCX240S

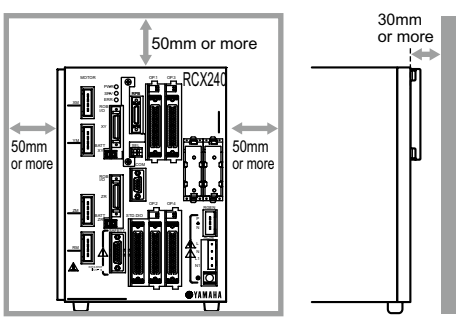
Basic specifications

	Item		Model: RCX240 / RCX240S
Basic specifications	Number of controllable axes		4 axes maximum (Control simultaneously: 4 axes)
	Controllable robots		Single-axis robot FLIP-X, Linear motor single-axis robot PHASER, Cartesian robot XY-X, SCARA robot YK-XG, Pick & place robot YP-X
	Maximum power consumption		2500VA (RCX240) / 1500VA (RCX240S)
	Capacity of the connected motor		1600W
	Dimensions		W180 × H250 × D235mm
	Weight		6.5kg
	Input power supply	Control power supply	Single phase AC200 to 230V +/-10% maximum (50/60Hz)
		Motor power supply	Single phase AC200 to 230V +/-10% maximum (50/60Hz)
Axis control	Drive method		AC full-digital software servo
	Position detection method		Multi-turn resolver with data backup function, Magnetic linear scale
	Operating method		PTP (Point to Point), Linear interpolation, Circular interpolation, ARCH
	Coordinate system		Joint coordinates, Cartesian coordinates
	Position indication units		Pulses, mm (millimeters), deg (degrees)
	Speed setting		1% to 100% (In units of 1%. However speed is in units of 0.01% during single-axis operation by DRIVE statement.)
	Acceleration setting		1. Automatic acceleration setting based on robot model type and end mass parameter 2. Setting based on acceleration and deceleration parameter (Setting by 1% unit)
	Resolution		16384 P/rev, 1μm
	Origin search method		Incremental, Absolute, Semi-absolute
Program	Program language		YAMAHA BASIC (Conforming to JIS B8439 SLIM Language)
	Multitasks		8 tasks maximum
	Sequence program		1 program
	Point-data input method		Manual data input (coordinate value input), Direct teaching, Teaching playback
Memory	Memory capacity		364KB (total capacity of program and points) (available program capacity during use of maximum number of points is 84KB)
	Programs		100 program (Max.) 9,999: maximum lines per program 98KB: maximum capacity per program
	Points		10,000 points: maximum numbers of points
	Memory Backup battery		Lithium metallic battery (service life 4 years at 0°C to 40°C)
	Internal flash memory		512KB (ALL data only)
External input/output	STD.DIO	I/O input	General input 16 points, dedicated input 10 points (NPN / PNP specifications selectable)
		I/O output	General output 8 points, dedicated output 11 points
	SAFETY		Emergency stop input (Relay contact), Service mode input (NPN/PNP specification is set according to STD. DIO setting)
	Brake output		Relay contact
	Origin sensor input		Connectable to DC 24V normally-closed contact sensor
	External communications		RS232C: 1CH D-SUB9 (female) RS422: 1CH (Dedicated RPB)
	Options	Slots	4
		Type	Optional input/output (NPN/PNP): General input 24 points / General output 16 points
			CC-Link: Dedicated input 16 points, Dedicated Output 16 points, General input 96 points, General output 96 points (4 nodes occupied)
			DeviceNet: Dedicated input 16 points, Dedicated Output 16 points, General input 96 points, General output 96 points
			Profibus: Dedicated input 16 points, Dedicated Output 16 points, General input 96 points, General output 96 points
			Ethernet: IEEE802.3 10Mbps (10BASE-T)
			iVY: Camera input (2ch), camera trigger input, PC connection input
			Tracking: AB phase input, lighting trigger input, lighting power supply input/output
			Lighting control: lighting trigger input, lighting power supply input/output
Options	Programming box		RPB, RPB-E (with enable switch)
	Support software for PC		VIP+ / VIP
General specifications	Operating temperature		0°C to 40°C
	Storage temperature		-10°C to 65°C
	Operating humidity		35% to 85%RH (non-condensing)
	Absolute backup battery		Lithium metallic battery 3.6V 5400mAH (2700mAH × 2)
	Absolute data backup period		1 year (in state with no power applied)
	Noise immunity		IEC61000-4-4 Level 3
	Protective structure		IP10

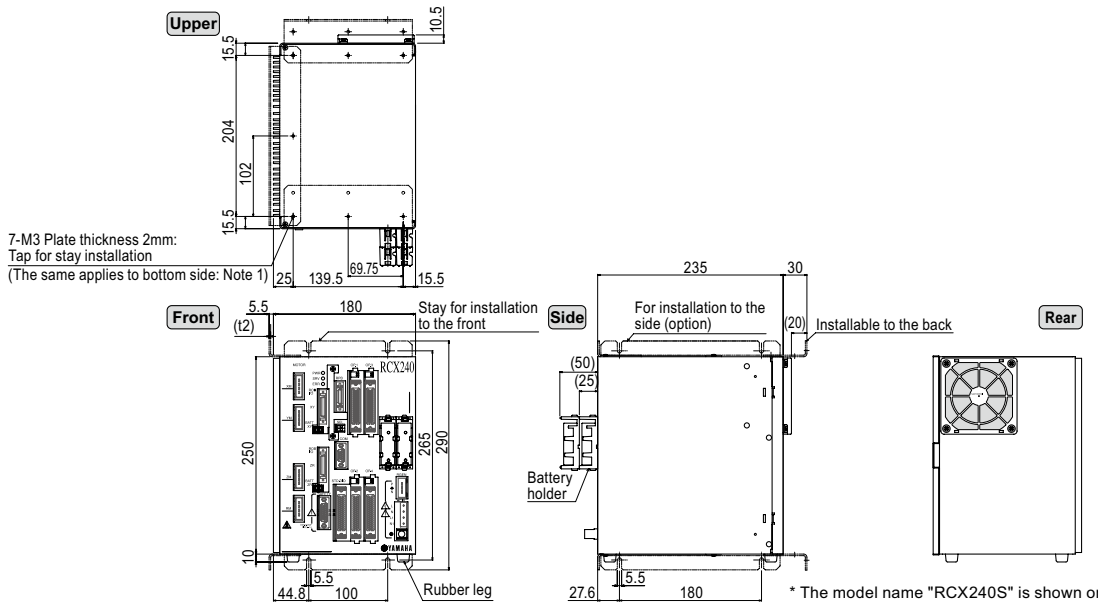
Installation conditions

- Install the RCX240/RCX240S inside the control panel.
- Install the RCX240/RCX240S on a flat, level surface.
- Install the RCX240/RCX240S in a well ventilated location, with space on all sides of the RCX240/RCX240S (See fig. at right.).
- Do not block the heat-sink on the side panel.
- Do not block the fan on the bottom of the controller.
- Ambient temperature : 0 to 40˚C
- Ambient humidity : 35 to 85% RH (no condensation)

● RCX240



Dimensions



* The model name "RCX240S" is shown on the RCX240S front panel.

Power capacity

The required power supply capacity and heat emission will vary depending on the robot type and number of axes.

Using the following table as a general guide consider the required power supply preparation and control panel size, controller installation, and cooling method.

(1) When connected to SCARA robot

Robot type				Power capacity (VA)	Generated heat amount (W)
Standard type	Clean type	Dust-proof & drip-proof type	Wall-mount / Ceiling-mount / inverse type		
YK180X, 220X	–	–	–	500	63
YK250XG, 350XG, 400XG 500XGL, 600XGL	YK250XGC, 350XGC, 400XGC 500XGLC, 600XGLC	YK250XGP, 350XGP, 400XGP 500XGLP, 600XGLP	YK300XHS, 400XHS	1000	75
–	YK500XC, 600XC	YK500XP, 600XP	YK500XS, 600XS	1500	88
YK550X, 500XG, 600XG	–	YK500XGP, 600XGP	YK500XGS, 600XGS	1700	93
–	YK700XC, 800XC, 1000XC	YK700XP, 800XP, 1000XP	YK700XS, 800XS, 1000XS	2000	100
YK600XGH, 700XG, 800XG, 900XG, 1000XG, 1200X	–	YK600XGHP, 700XGP, 800XGP, 900XGP, 1000XGP	YK700XGS, 800XGS, 900XGS, 1000XGS	2500	113

(2) When connected to 2 axis (Cartesian robot and/or multi-axis robot)

Axial current sensor value Note		Power capacity (VA)	Generated heat amount (W)
X axis	Y axis		
05	05	600	65
10	05	800	70
10	10	1000	75
20	05	1100	78
20	10	1300	83
20	20	1700	93

(3) When connected to 3 axis (Cartesian robot and/or multi-axis robot)

Axial current sensor value Note			Power capacity (VA)	Generated heat amount (W)
X axis	Y axis	Z axis		
05	05	05	700	68
10	05	05	900	73
10	10	05	1000	75
10	10	10	1200	80
20	05	05	1200	80
20	10	05	1300	83
20	10	10	1500	88
20	20	05	1600	90
20	20	10	1800	95
20	20	20	2000	95

(4) When connected to 4 axis (Cartesian robot and/or multi-axis robot)

Axial current sensor value Note				Power capacity (VA)	Generated heat amount (W)
X axis	Y axis	Z axis	R axis		
05	05	05	05	800	70
10	05	05	05	1000	75
10	10	05	05	1100	78
10	10	10	05	1300	83
10	10	10	10	1400	85
20	05	05	05	1200	80
20	10	05	05	1400	85
20	10	10	05	1500	88
20	10	10	10	1700	93
20	20	05	05	1600	90
20	20	10	05	1800	95
20	20	10	10	2000	100
20	20	20	05	2100	103
20	20	20	10	2200	105
20	20	20	20	2500	113

Note. Even if axial current sensor values for each axis are interchanged no problem will occur.

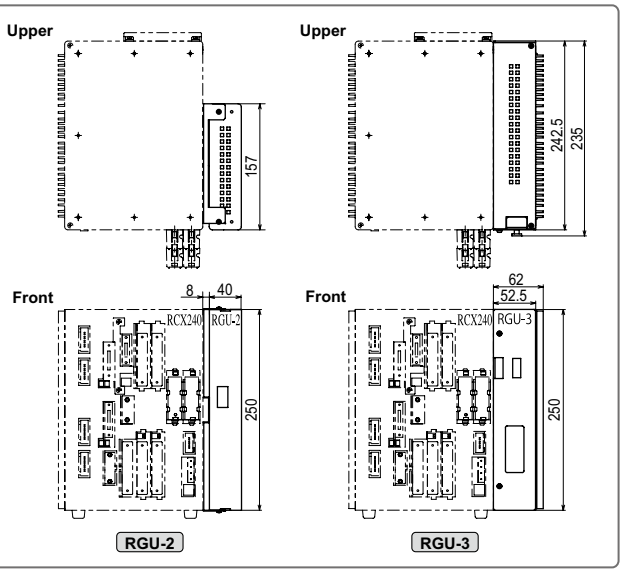
Note. Motor capacity vs. current sensor table

Connected motor capacity	Current sensor
100W or less	05
200W	10
400W or more	20

Note. Motor output of the B14H is 200W but the current sensor is 05.

RCX240/RCX240S

Regenerative unit



RGU-2 basic specifications

Item	RGU-2
Model	KX0-M4107-20 (including cable supplied with unit)
Dimensions	W40 × H250 × D157mm
Weight	0.9kg
Regenerative voltage	Approx. 380V or more
Regenerative stop voltage	Approx. 360V or less
Accessory	Cable for connection with controller (300mm)

Note. Always leave an empty space (gap of about 20mm) between this unit and the adjacent controller. Also, always use the dedicated cable when connecting the controller.

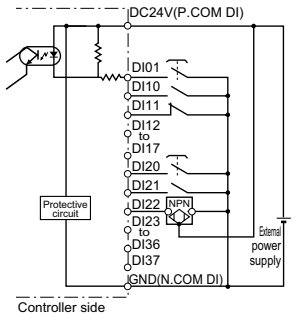
RGU-3 basic specifications

Item	RGU-3
Model	KX0-M4107-30 (including cable supplied with unit)
Dimensions	W62 × H250 × D242.5mm
Weight	3.7kg
Regenerative voltage	Approx. 380V or more
Regenerative stop voltage	Approx. 360V or less
Accessory	Cable for connection with controller (300mm)

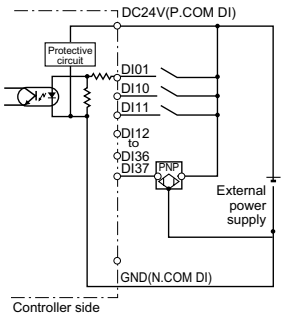
Note. Cannot be installed as a separate unit.

Example of input signal connection

NPN specification

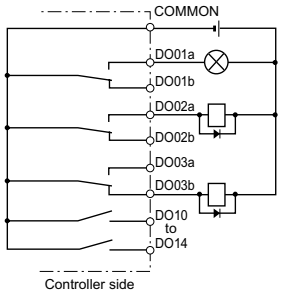


PNP specification

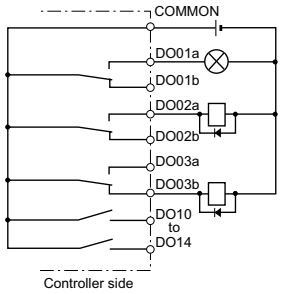


Example of output signal connection

NPN specification

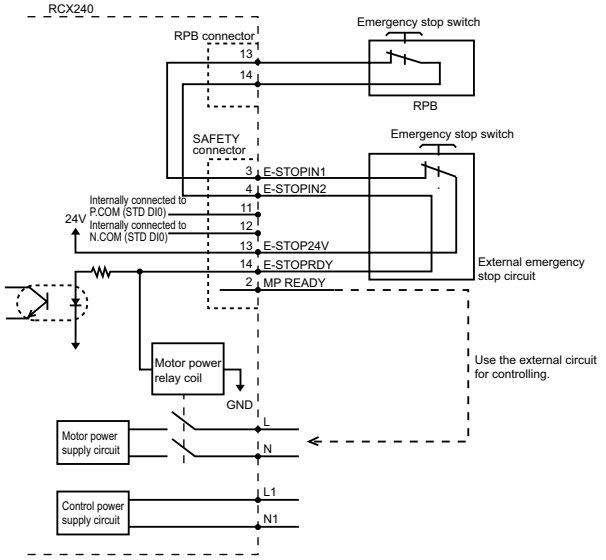


PNP specification

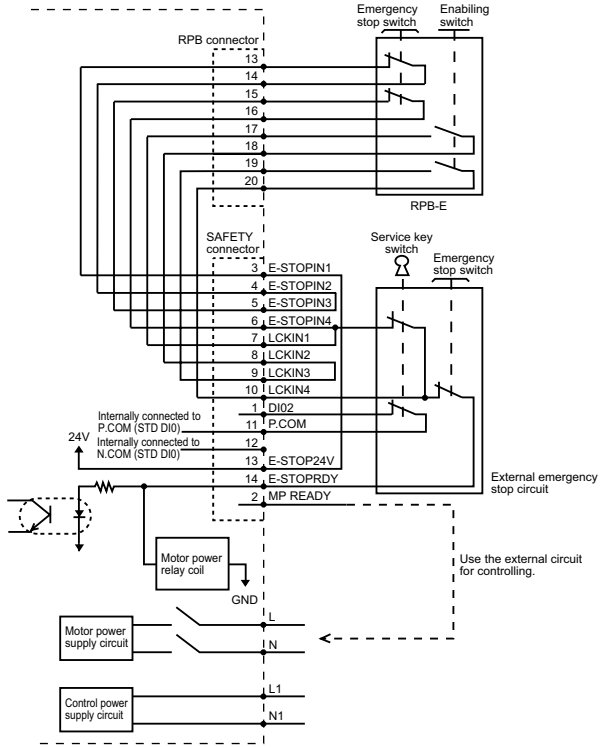


Emergency input signal connections

Connection when using the standard RPB with an external emergency stop circuit.



Connections using the RPB-E enabling switch compatible programming unit with external emergency stop circuit (PNP specification)



Installing an external safety circuit will satisfy safety category class 4 standards. See P.485 for more information.

Connector input / output signals

PIN	I/O No.	Name	Note
1	DI05	I/O command execution trigger input	Common terminal : P.COMDI N.COMDI (Photo-coupler input) NPN specification : Source type PNP specification : Sink type
2	DI01	Servo ON input	
3	DI10	Sequence control	
4	DI11	Interlock	
5	DI12	Program start	
6	DI13	AUTO mode input	
7	DI14	Return-to-origin	
8	DI15	Program reset	
9	DI16	MANUAL mode input	
10	DI17	Absolute reset / Return-to-origin	
11	DI20	General input 20	
12	DI21	General input 21	
13	DI22	General input 22	
14	DI23	General input 23	
15	DI24	General input 24	
16	DI25	General input 25	
17	DI26	General input 26	
18	DI27	General input 27	
19	DI30	General input 30	
20	DI31	General input 31	
21	DI32	General input 32	
22	DI33	General input 33	
23	DI34	General input 34	
24	DI35	General input 35	
25	DI36	General input 36	
26	DI37	General input 37	

PIN	I/O No.	Name	Note
27	COMMON	Relay common	(Relay output) Maximum capacity of each terminal (resistance load) : DC 24V 0.5A Common terminal : COMMON
28	DO01b	CPU_OK (B contact)	
29	DO01a	CPU_OK (A contact)	
30	DO02b	Servo ON output (B contact)	
31	DO02a	Servo ON output (A contact)	
32	DO03b	Alarm (B contact)	
33	DO03a	Alarm (A contact)	
34	DO10	AUTO mode output	
35	DO11	Return-to-origin complete	
36	DO12	Sequence program in-progress	
37	DO13	Robot program in-progress	
38	DO14	Program reset	
39	DO20	General output 20	(Transistor output) NPN specification or PNP specification Maximum capacity of each terminal (resistance load) : 0.1A +Common terminal : DC+24V - Common terminal : GND
40	DO21	General output 21	
41	DO22	General output 22	
42	DO23	General output 23	
43	DO24	General output 24	
44	DO25	General output 25	
45	DO26	General output 26	
46	DO27	General output 27	
47	DC24V	DC+24V (P.COMDI)	External power supply input
48			
49	GND	GND (N.COMDI)	
50			

SAFETY connector signals

Terminal number	RPB connected		RPB-E connected	
	I/O No.	Name	I/O No.	Name
1	DI02	SERVICE mode	DI02	SERVICE mode
2	MP READY	Motor power ready signal	MP READY	Motor power ready signal
3	E-STOPIN 1	Emergency stop input 1	E-STOPIN 1	Emergency stop input 1
4	E-STOPIN 2	Emergency stop input 2	E-STOPIN 2	Emergency stop input 2
5	NC	NC	E-STOPIN 3	Emergency stop input 3
6	NC	NC	E-STOPIN 4	Emergency stop input 4
7	NC	NC	LCKIN 1	Enabling switch input 1
8	NC	NC	LCKIN 2	Enabling switch input 2
9	NC	NC	LCKIN 3	Enabling switch input 3
10	NC	NC	LCKIN 4	Enabling switch input 4
11	P.COM	DC+24V (P.COM DI)	P.COM	DC+24V (P.COM DI)
12	N.COM	GND (N.COM DI)	N.COM	GND (N.COM DI)
13	E-STOP 24V	Emergency stop input supply	E-STOP 24V	Emergency stop input supply
14	E-STOPRDY	Emergency stop READY signal	E-STOPRDY	Emergency stop READY signal
15	NC	NC	NC	NC

Standard functions of the controller

Function	Description
Operation mode	Automatic mode (main task: execution of program, execution of step), Program mode (main task: creation of program), Manual mode (main task: jog movement, point teaching), System mode (main task: parameter editing, data initialization), Utility mode (main task: operation of motor power source)
Command	Array declarator command (DIM statement), Assignment command (numeric value assignment statement, character string assignment statement, point definition statement), Movement related command (MOVE statement, DRIVE statement, PMOVE statement), Condition branching command (IF statement, FOR statement, WHILE statement), External output command (DO statement, MO statement, LO statement, TO statement, SO statement), Parameter command (ACCEL statement, OUTPOS statement, TOLE statement), Task related command (START statement, SUSPEND statement, CUT statement), Condition wait command (WAIT statement), etc.
Function	Arithmetic function (SIN function, COS function, TAN function), Character string function (STR$ function, LEFT$ function, MID$ function, RIGHT$ function), Point function (WHERE function, JTOXY function, XYTOJ function), Parameter function (ACCEL statement, OUTPOS statement, TOLE statement), etc.
Variable	Simple variable (integer type variable, real number type variable, character string type variable), Array variable (integer type variable, real number type variable, character string type variable), Point variable, Shift variable, Element variable (point element variable, shift element variable), Input/output variable, etc.
Operator	Arithmetic operator (+, -, *, /, MOD), Logical operator (AND, OR, XOR), Comparison operator (=, <, >, <>, <=, >=)
Monitor	Monitor of input/output (200ms interval)
On-line command	Key operation command (AUTO, RUN, RESET, STEP), Data handling command (READ, WRITE, ?VER, ?CONFIG), Utility command (COPY, ERA, INIT), Robot language command (independently executable command)
Data file	Program, Point, Parameter, Shift, Hand, All, Error history, etc.
Internal timer	10ms interval
Program break point	4 points at maximum

RCX240/RCX240S

Robot Language Table

General commands

Language	Function
DECLARE	Declares that a label or sub-procedure is in an external program.
DEF FN	Defines a function that is available to the user.
DIM	Declares the name of an array variable and the number of elements.
EXIT FOR	Terminates a FOR statement to NEXT statement loop.
FOR to NEXT	Controls repetitive operations
GOSUB to RETURN	Jumps to a subroutine with the label specified by a GOSUB statement and executes the subroutine.
GOTO	Unconditionally jumps to the line specified by a label.
HALT	Stops a program and resets it.
HOLD	Pauses a program.
IF	Allows control flow to branch according to conditions.
LET	Executes a specified assignment statement.
ON to GOSU	Jumps to a subroutine with each label specified by a GOSUB statement according to conditions and executes the subroutine.
ON to GOTO	Jumps to each line specified by a label according to conditions.
REM	All characters that follow REM or an apostrophe (') are viewed as comments.
SELECT CASE to END SELECT	Allows control flow to branch according to conditions.
SWI	Switches the currently executed program to a specified program, and executes from the first line after compiling.
WHILE to WEND	Controls repetitive operations.
Label statement	Defines "labels" in program lines.

Robot operation

Language	Function
ABSRST	Performs return-to-origin along robot absolute motor axes.
DRIVE	Performs an absolute movement of each axis in the main group.
DRIVEI	Performs a relative movement of each axis in the main group.
MOVE	Performs an absolute movement of the main robot axes.
MOVEI	Performs a relative movement of the main robot axes.
ORIGIN	Performs return-to-origin on an incremental mode axis or absolute search on a semi-absolute mode axis.
PMOVE	Performs a pallet movement of the main robot axes.
SERVO	Controls the servo ON/OFF of the specified axes in the main group or all axes (in main group and sub group).

I/O control

Language	Function
DELAY	Waits for the specified length of time (ms).
DO	Outputs the specified value to the DO ports.
LO	Outputs the specified value to the LO port to prohibit axis movement or permit axis movement.
MO	Outputs the specified value to the MO ports.
OUT	Turns ON the bits of the specified output ports and the command statement ends.
RESET	Turns OFF the bits of the specified output ports.
SET	Turns ON the bits of the specified output ports
SO	Outputs the specified value to the SO port.
TO	Outputs the specified value to the TO port.
WAIT	1. Waits until the condition in DI/DO conditional expression are met. 2. Waits until positioning on the robot axes is complete (within the tolerance range).

Coordinate control

Language	Function
CHANGE	Switches the hand of the main robot.
HAND	Defines the hand of the main robot.
RIGHTY / LEFTY	Selects whether the main robot will be "right-handed" or "left-handed" when moving to a point specified on a Cartesian coordinate system.
SHIFT	Sets the shift coordinates for the main robot by using the shift data specified by a shift variable.

Condition change

Language	Function
ACCEL	Changes the acceleration coefficient parameter of the main group.
ARCH	Changes the arch position parameter of the main group.
ASPEED	Changes the automatic movement speed of the main group.
AXWGHT	Changes the axis tip weight parameter of the main group.
DECEL	Changes the deceleration rate parameter of the main group.
ORGORD	Sets the axis sequence parameter to perform return-to-origin and absolute search in the main group.
OUTPOS	Changes the OUT position parameter of the main group.
PDEF	Defines the pallet used to execute a pallet movement command.
SPEED	Changes the program speed for the main group.
TOLE	Changes the tolerance parameter of the main group.
WEIGHT	Changes the tip weight parameter of the main robot.

Communication control

Language	Function
ONLINE / OFFLINE	Changes communication mode and initialize the communication port.
SEND	Sends the read file data into a write file.

Screen control

Language	Function
PRINT	Displays the value of specified variable on the MPB/RPB screen.

Key control

Language	Function
INPUT	Assigns a value to the variable specified from the MPB/RPB.

Procedure

Language	Function
CALL	Calls up sub-procedures defined by the SUB and END SUB statements.
EXIT SUB	Terminates the sub-procedure defined by the SUB and END SUB statements.
SHARED	Does not permit variables declared with a program written outside a subprocedure (SUB to END SUB) to be passed on as dummy arguments, but allows them to be referred to with a sub-procedure.
SUB to END SUB	Defines a sub-procedure.

Task control

Language	Function
CHGPRI	Changes the priority of the specified task.
CUT	Terminates a task currently being executed or temporarily stopped.
EXIT TASK	Terminates its own task currently being executed.
RESTART	Restarts a task that is temporarily stopped.
START	Sets the task number and priority of the specified task and starts that task.
SUSPEND	Temporarily stops another task being executed.

Error control

Language	Function
ON ERROR GOTO	If an error occurs during program execution, this command allows the program to jump to the error processing routine specified by the label without stopping the program, or stops the program and displays the error message.
RESUME	Resumes the program execution after recovery from an error. This command is used in the error processing routine.
ERL	Gives the line number where an error occurred.
ERR	Gives the error code number when an error occurred.

PATH control

Language	Function
PATH	Sets the PATH motion on the main robot axis.
PATH END	Terminates the path setting for PATH motion.
PATH SET	Starts the path setting for PATH motion.
PATH START	Starts the PATH motion.

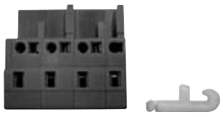
Torque control

Language	Function
DRIVE (with torque limit option)	Executes an absolute movement command on each axis in the main group.
TORQUE	Changes the maximum torque instruction for the specified main group axis.
TRQTIME	Sets the current limit time-out period on the specified main group axis when using a torque limit setting option in the DRIVE statement.
TRQTIME	Sets the current limit time-out period on the specified main group axis when using a torque limit setting option in the DRIVE statement.

Accessories and part options

Standard accessories

Power connector + wiring connection lever



Model	KAS-M5382-00

Note. Jointly used by SR1-P / SR1-X, RCX221 / 222.

Safety connector

Model	KX0-M5163-00

RPB terminator (dummy connector)

Attach this to the RPB connector during operation with the programming box RPB removed.

Model	KAS-M5163-00

Note. Jointly used by RCX221 / 222.

Standard I/O (STD.DIO) connector

Model	KX0-M533G-00

L type stay (for installing front side, rear side.)

Use to install the controller.

Model	KX0-M410H-00

Note. Model No. is for a single bracket (L type stay). (Two are required to install one controller.)

Battery case

This is the absolute battery holder.

Model	KBG-M5395-00

Absolute battery

Battery for absolute data back-up.

Absolute battery basic specifications

Item	Absolute battery
Model	KAS-M53G0-11
Battery type	Lithium metallic battery
Battery capacity	3.6V/2,750mAh
Data holding time	About 1 year Note1 (in state with no power applied)
Dimensions	ϕ17 × L53mm
Weight Note2	22g

Note 1. When using 2 batteries. Note 2. Weight of battery itself.
Note. Jointly used by SR1-X, RCX222.
Note. The absolute battery is subject to wear and requires replacement.
If trouble occurs with the memory then remaining battery life is low so replace the absolute battery. The battery replacement period depends on usage conditions. But generally you should replace the battery after about 1 year counting the total time after connecting to the controller and left without turning on the power.

Absolute battery installation conditions

1 to 2 batteries are required for each 2 axes.

- 1 battery…Data storage time of approximately 6 months (with no power applied)
- 2 batteries…Data storage time of approximately 1 year (with no power applied)

Note. Absolute battery is not required for either of the 2 axes if using incremental or semi-absolute specifications.

Options

L type stay (for side surface installation)

Use to install the controller.

Model	KX0-M410H-10

Note. Model No. is for a single bracket (L type stay).

Programming box RPB / RPB-E

This device can perform all operations such as manual robot operation, program entry and edit, teaching and parameter settings.

	RPB	RPB-E
Model	KBK-M5110-10	KBK-M5110-00
Enable switch	–	3-position
CE marking	Not supported	Applicable

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Support software for PC VIP+

VIP+ is a simple to use application software that makes tasks such as robot operation, writing-editing programs, and point teaching easy to visually understand.

VIP+ software model	KX0-M4966-00

Data cables

Communication cable for VIP+.
Select from USB cable or D-sub cable.

Model	USB type (5m)	KBG-M538F-00
	D-Sub type 9pin-9pin (5m)	KAS-M538F-10

Note. Data cable jointly used for POPCOM, VIP, VIP+.
Note. USB driver for communication cable can also be downloaded from our website (driver supports VIP+, POPCOM, and TS-Manager).

Environment

OS	Microsoft Windows 2000 / XP / Vista (32bit / 64Bit) / 7 (32bit / 64Bit)
CPU	Processor that meets or exceeds the suggested requirements for the OS being used.
Memory	Suggested amount of memory or more for the OS being used.
Hard disk	40MB of available space required on installation drive.
Communication method	RS-232C, Ethernet Note. For Ethernet communication, Ethernet unit for RCX series controller is required.
Applicable robot controllers	RCX221 / RCX222 / RCX141 / RCX142 / RCX240

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Note. Ethernet is a registered trademark of Xerox Corporation.

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Support software for PC

VIP+ Windows

Visual Integrated Programming

Applicable controllers ▶ RCX221 RCX222 RCX141 RCX142 RCX240 RCX240S

VIP+ is an easy to operate application software that makes tasks such as robot operation, writing-editing programs, and point teaching easy to visually understand.

Features New support software VIP with improved ease of use

1 GUI updated for enhanced usability

The user interface has been improved with the VIP Windows function kept as it is so as to achieve more ease of use.

2 Data displayed in the tree view form

The data included in the controller is displayed legibly.

3 Fully equipped tool bar

Each of various functions can be executed by simple one click on the tool bar.

4 Expanded monitor function

The I/O conditions and variables in the controller can be monitored at real time. In the advanced mode, it is also possible to attach any label (Note) to general purpose input/output and others.

Note. The label is stored in PC.

5 Data operation using the new drag & drop function

The data can be stored easily by using the drag & drop function. Likewise, the stored data can be restored to the controller by operating the mouse only.

Select the data to be stored.

Drag the selected data to the document window and drop it there.

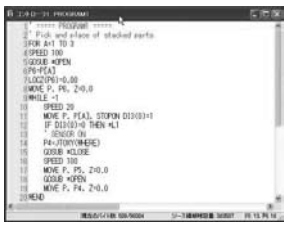
Specify the file name and this completes the storage procedure.

6 Input the data in the work sheet form (Parameter, Point data)

It is also possible to copy and paste the data from the other spread sheet (chart calculation software).

7 Syntax coloring when editing the program

When reserved words (character string reserved as the robot language) are inputted, they are colored automatically, making them noted at one glance for easier program editing.



8 Program execution monitor

The step being performed during the program execution can be monitored. Thus, it ispossible to check which step is performed without stopping the program, thereby debugging of the program is made much easier.

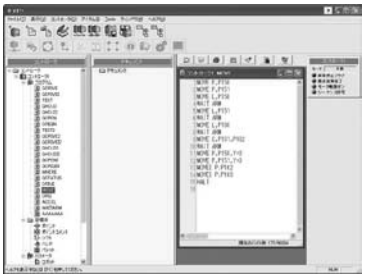
9 List appointing (point where the system is restored)

It is possible to create the system restoration point at any timing. By doing so at important points in the system constructing process when, for example, something faulty is found after the system was changed, the system can be returned to the state before such change easily.

VIP PLUS function

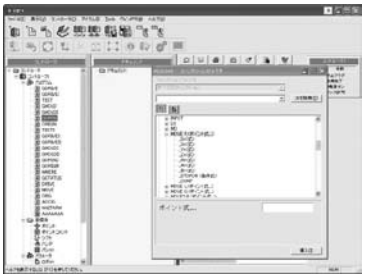
1 Easy to use

With a number of robot operation items provided on one screen, any operator can operate easily without memorizing the menu construction.



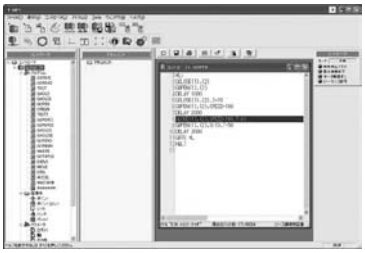
2 Programming editing

The program, point, parameter, shift, and hand can be edited on the PC alone. Equipped with the function selector having the command searching function which enables to input the robot language with ease.



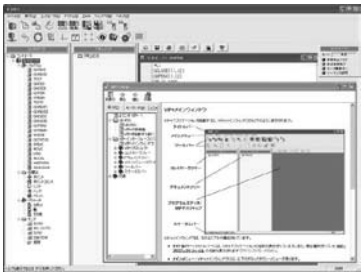
3 Data check function

Provided with the equivalent data check function to that of a robot controller, it is possible to correct data errors before operation.



4 Help function

When more information is needed during operation, press the [F1] or [HELP] key, and the help screen will appear.

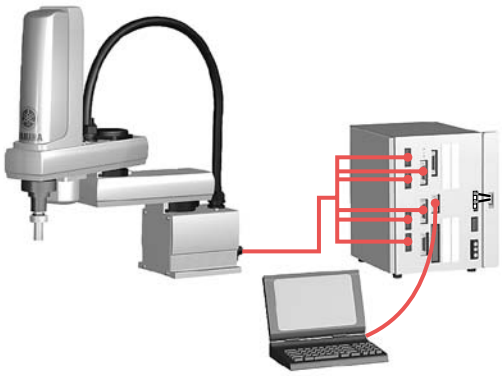


5 Robot operation

By connecting PC and controller with communication cable, robot operation will be available by the on-line command.

6 On-line editing

Connecting a PC and the controller with a communication cable enable to edit data from robot controllers just as with RPB / RPB-E.

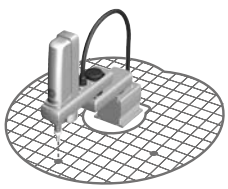


7 Creating point data

There are three methods available for creating the point data.

MDI (Manual Data Input) teaching

The numeric keyboard is used to enter position coordinate data directly.



Remote teaching

The robot arm is actually moved to the target position using the keys for point data registration.

Direct teaching

The robot arm is manually moved to the target position with the servo motors off for point data registration.

Environment / Ordering method ▶ P.448

VIP+

Support software for PC VIP+

Model	KX0-M4966-00

Environment

OS	Microsoft Windows 2000 / XP / Vista (32bit / 64Bit) / 7 (32bit / 64Bit)
CPU	Processor that meets or exceeds the suggested requirements for the OS being used.
Memory	Suggested amount of memory or more for the OS being used.
Hard disk	40MB of available space required on installation drive.
Communication method	RS-232C, Ethernet Note. For Ethernet communication, Ethernet unit for RCX series controller is required.
Applicable robot controllers	RCX221 / RCX222 / RCX141 / RCX142 / RCX240

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Note. ADOBE and ADOBE READER are registered trademarks of Adobe Systems Incorporated.
Note. Ethernet is a registered trademark of Xerox Corporation.

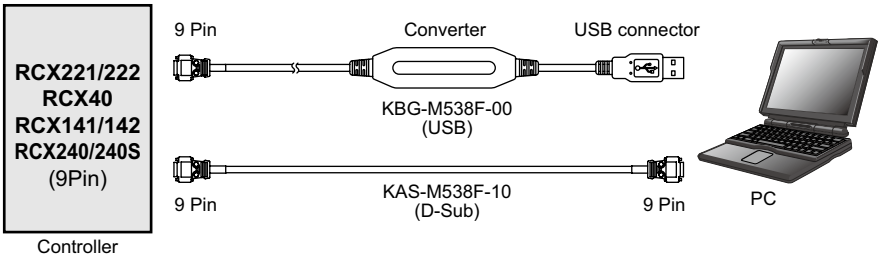
Data cables (5m)

Communication cable for VIP+.
Select from USB cable or D-sub cable.

Model	USB type (5m)	KBG-M538F-00
	D-Sub type 9pin-9pin (5m)	KAS-M538F-10

Note. Data cable jointly used for POPCOM, VIP, VIP+.
Note. USB driver for communication cable can also be downloaded from our website (driver supports VIP+, POPCOM, and TS-Manager).

Controller and data cable connection diagrams



Programming box

RPB/RPB-E

Applicable controllers ▶ RCX221 RCX222 RCX240 RCX240S

Customers using the RCX141 / RCX142 controllers should use the connector converter cable (See P.475.)

All operations can be performed from this device including manual robot operation, programming entry and editing, teaching and setting parameters. The display works interactively with the operator so even an absolute beginner can easily learn how to use programming box.

RPB / RPB-E basic specifications

Name	RPB	RPB-E
External view		
Applicable controllers	RCX221 / RCX222 / RCX240 / RCX240S	
Model	KBK-M5110-10	KBK-M5110-00
Display	LCD (40characters 8 lines)	
Emergency stop button	Normally closed contact point (with lock function)	
Enable switch	–	3-position
CE marking	Not supported	Applicable
Operating temperature	0°C to 40°C	
Operating humidity	35% to 85%RH (non-condensing)	
Dimensions	W180 × H250 × D50mm (Strap holder, emergency stop button not included.)	
Weight	600g	
Cable length	5m (Standard), 12m (Options)	

Part names and function

Display (screen)
Liquid crystal display (LCD) shows different types of information with 8 lines × 40 characters. Contrast is adjustable.

Sheet keys
These are key switches for operating the robot or entering programs, etc. These are broadly grouped into 3 blocks consisting of function keys, control keys, and data keys.

Emergency stop button
Pressing this button during robot operation sets the robot to emergency stop. These are B contact type switches.

RPB connector
This is a connector for connecting the RPB to the controller.

RPB-E Rear side

3-position enable switch (only on RPB-E)
This switch is usable as part of an external (remote) safety circuit.
Pressing this switch inwards or releasing it cuts off the (RPB/robot) circuit. However that circuit is operable when this switch is in middle position.
This enable switch is usually operable in service mode. It functions as part of an external safety circuit so that releasing the enable switch or pressing it inwards set the robot to emergency stop.

Field network system with minimal wiring

NETWORK

Applicable controllers ▶ RCX221 RCX222 RCX240 RCX240S

CC-Link

- Option unit with networking functions that can be incorporated in YAMAHA robot controllers, RCX221 / RCX222 / RCX240 / RCX240S.
- As connection of the robot system and the sequencer requires only one (4-wire) dedicated cable, it is possible to save wiring of the entire system, which contributes to efficient wiring work, reduction of installation and maintenance costs, etc.
- 96 general use inputs/outputs, 16 dedicated inputs/outputs (4 nodes occupied).
- Capable of simulating serial operation of parallel I/O. With this function set properly, it is possible to control various I/O units connected to the parallel I/O of the robot controller, such as sensor and relay from the sequencer side without using the robot program, as if they are I/Os of the CC-Link system.

Basic specifications for network modules CC-Link

Item	Network modules CC-Link
Applicable controllers	RCX221 / RCX222 / RCX240 / RCX240S
Version supporting CC-Link	Ver. 1.10
Remote station type	Remote device node
Number of occupied stations	Fixed to 4 stations
Station number setting	1 to 61 (set from the Rotary swich on board)
Communication speed setting	10Mbps, 5Mbps, 2.5Mbps, 625Kbps, 156Kbps (set from the Rotary swich on board)
No. of CC-Link I/O Note1	General input 96 points, General output 96 points, Dedicated input 16 points, Dedicated output16 points
Parallel external I/O Note2	A function that simulates serial communication enables individual control of the various points from a master sequencer, regardless of the robot program.
Shortest distance between nodes Note3	0.2 m or more
Overall length Note3	100m/10Mbps, 150m/5Mbps, 200m/2.5Mbps, 600m/625Kbps, 1200m/156Kbps
Monitor LED	RUN, ERR, SD, RD

Note 1. Controller I/Os are updated every 10ms.
Note 2. With RCX 141/142, the exclusive input of the parallel I/O cannot be used other than the interlock input.With RCX221 / 222, the exclusive input of the parallel I/O cannot be used. (The interlock input terminal is located on the SAFETY connector side.)
Note 3. These values apply when a cable that supports CC-Link Ver.1.10 is used.

DeviceNet

- Option unit with networking functions that can be incorporated in YAMAHA robot controllers, RCX221 / RCX222 / RCX240 / RCX240S.
- As connection of the robot system and the sequencer requires only one (5-wire) dedicated cable, it is possible to reduce wiring of the entire system, which contributes to efficient wiring work, reduction of installation and maintenance costs, etc.
- Capable of simulating serial operation of parallel I/O. With this function set properly, it is possible to control various I/O units connected to the parallel I/O of the robot controller, such as sensor and relay from the sequencer side without using the robot program, as if they are I/Os of the DeviceNet system.

Basic specifications for network modules DeviceNet

Item		Network modules DeviceNet
Applicable controllers		RCX221 / RCX222 / RCX240 / RCX240S
Applicable DeviceNet specifications		Volume 1 Release2.0 / Volume 2 Release2.0
Device Profile Name		Generic Device (device number 0)
Number of occupied CH Note1		Normal: Input/output 24ch each, Compact: Input/output 2ch each
MAC ID setting		0 to 63
Transmission speed setting		500Kbps, 250Kbps, 125Kbps (set using DIP switch on board)
DeviceNet I/O Note2	Normal	General input 96 points, General output 96 points, Dedicated input 16 points, Dedicated output 16 points
	Compact	General input 16 points, General output 16 points, Dedicated input 16 points, Dedicated output 16 points
Parallel external I/O Note3		The master module and up to four ports can be controlled regardless of the robot program by using the pseudoserialization function.
Network length	Overall length Note4	100m/500Kbps, 250m/250Kbps, 500m/125Kbps
	Branch length / Overall branch length	6m max./39m max., 6m max./78m max., 6m max./156m max.
Monitor LED		MS (Module Status), NS (Network Status)

Note1. Use the robot parameter to select Normal or Compact. However, with the controllers earlier than Ver.9.08 of RCX221 / 222, this selection is not available and the setting remains the same as Normal.
Note2. Controller I/Os are updated every 10ms.
Note3. With RCX221 / 222, the exclusive input of the parallel I/O cannot be used. (The interlock input terminal is located on the SAFETY connector side.)
Note4. These values apply when a thick cable is used. The distance is less when a fine cable is used or when thick and fine cables are mixed in use.

Profibus

- Option unit used to connect a YAMAHA robot controllers RCX221 / RCX222 / RCX240 / RCX240S to Profibus.
- Optimum for high speed data communication and complicated communication processing.
- Communication is made available among devices of multiple number of manufacturers.
- Capable of simulating serial operation of parallel I/O. With this function set properly, it is possible to control various I/O units connected to the parallel I/O of the robot controller, such as sensor and relay from the sequencer side without using the robot program, as if they are I/Os of the Profibus system.

Basic specifications for network modules Profibus

Item	Network modules Profibus
Applicable controllers	RCX221 / RCX222 / RCX240 / RCX240S
Communication profile	Profibus-DP slave
Number of occupied nodes	1 node
Setting of station address	1 to 99 (set using Rotary switch on board)
Setting of communication speed	9.6Kbps, 19.2Kbps, 93.75Kbps, 187.5Kbps, 500Kbps, 1.5Mbps, 3Mbps, 6Mbps, 12Mbps (automatic recognition)
Profibus I/O Note1	General input 96 points, General output 96 points, Dedicated intput 16 points, Dedicated output 16 points
Parallel external I/O Note2	The master module and up to four ports can be controlled regardless of the robot program by using the pseudoserialization function.
Overall length	100m/3M·6M·12Mbps, 200m/1.5Mbps, 400m/500Kbps, 1000m/187.5Kbps, 1200m/9.6K·19.2K·93.75Kbps
Monitor LED	RUN, ERR, SD, RD, DATA-EX

Note 1. The shortest I/O update interval of the controller is 10ms but the actual I/O update time varies depending on the update time with the master station.
Note 2. With RCX221 / 222, the exclusive input of the parallel I/O cannot be used. (The interlock input terminal is located on the SAFETY connector side.)

Ethernet

- Option unit used to connect a YAMAHA robot controller to Ethernet, which can be incorporated in YAMAHA robot controllers, RCX221 / RCX222 / RCX240 / RCX240S. Connection of this unit to the network operation by the TCP/IP protocol with a 10BASE-T cable makes data exchange with a robots easy.
- Capable of making an easy access from the TELNET terminal to the robot controller. As the command system is the same as that by the RS-232C communication, even first-time users can use it easily. (Windows PCs have a built-in TELNET terminal called TELNET.EXE as a standard equipment.)
- With a number of controllers connected in the network, it is possible to perform integrated information control over robots even at a distance from the work site.

Basic specifications for network modules Ethernet

Item	Network modules Ethernet
Applicable controllers	RCX221 / RCX222 / RCX240 / RCX240S
Network specification	As specified for Ethernet (IEEE802.3)
Connector specification	RJ-45 connector (8-pole modular connector) 1 port
Baud rate	10Mbps (10BASE-T)
Communication mode	Half Duplex (Half-duplex)
Network protocol	Application layer: TELNET / Transport layer: TCP / IP Network layer: IP, ICMP, ARP / Data link layer: CSMA/CD / Physical layer: 10BASE-T
Number of simultaneous log inputs	1
Setting of IP address, etc.	Set from RPB
Monitor LED	Run, Collision, Link, Transmit, Receive

Field network system with minimal wiring

NETWORK

Applicable controllers ▶ RCX240 RCX240S

EtherNet/IP

- Option unit with networking functions that can be incorporated in YAMAHA robot controllers, RC240 / RCX240S.
- High-speed transfer of massive data to and from peripheral devices at 100Mbps.
- As connection of the robot system and the sequencer requires only 100-Base TX cable, it is possible to reduce wiring of the entire system, which contributes to efficient wiring work, reduction of installation and maintenance costs, etc.
- Capable of simulating serial operation of parallel I/O. With this function set properly, it is possible to control various I/O units connected to the parallel I/O of the robot controller, such as sensor and relay from the sequencer side without using the robot program, as if they are I/Os of the EtherNet/IP system.
- Minimal equipment wiring streamlines wiring tasks and helps cut equipment installation and maintenance costs.
- Function

Function	Supported	Note
SIO	○	
Remote command	○	
I/O command	○	
Online command	×	Connect to COM port (RS-232C) or add an EtherNet board (telnet).
Connection to VIP+	×	

- Basic specifications for network modules EtherNet/IP

Spec. Item \ Model	EtherNet/IP compatible module		
Controller model	RCX240/RCX240S		
Software version	HOST : Ver.10.64 or higher VIP+ : Ver.2.5.0 or higher		
Network specifications	Conforms to Ethernet (IEEE 802.3).		
Applicable EtherNet/IP specifications	Volume 1 : Common Industrial protocol (CIP™) Edition 3.8 Volume 2 : EtherNet/IP Adaptation Edition 1.9		
Device type	Generic Device (Device No. 43)		
Data size	48 bytes each for input/output		
Transmission speed	10 Mbps/100 Mbps		
Connector specifications	RJ-45 connector (8-pole modular connector) 1 port		
Cable specifications	Refer to “4.1. LAN cable” in Chapter 2 of this guide.		
Max. cable length	100 m		
EtherNet/IP input/output points Note	Input (48 bytes in total)	byte 0-3 byte 4-31	Dedicated word input : 2 words General purpose word input : 14 words
		byte 32-33 byte 34-47	Dedicated bit input : 16 points General-purpose bit input : 96 points
	Output (48 bytes in total)	byte 0-3 byte 4-31	Dedicated word output : 2 words General-purpose word output : 14 words
		byte 32-33 byte 34-47	Dedicated bit output : 16 points General-purpose bit output : 96 points
Parallel external input	Regardless of the robot program, the master module and up to four ports can be controlled using the emulated serialization function.		
Settings, such as IP address	The settings are made with the programming box (RPB) or VIP+ (via a COM port or telnet).		
Monitor LEDs	Activity, Network Status, Link, Module Status		
CPU BOARD ASSY	KX0-M4210-2XX (Refer to “3. Installing into the robot controller” in Chapter 1 of this guide.)		

Note. Controller’s I/O update intervals are 10 ms at shortest, but actual I/O update intervals may vary depending on the update time for the master station.